JPRS 78818

25 August 1981

China Report

ECONOMIC AFFAIRS

No. 165

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REFORM OF SICHUAN BANKING SYSTEM DESCRIBED

Beijing ZHONGGUO JINRONG /CHINA'S FINANCE/ in Chinese No 6, 1981 pp 16-18

/Article on Sichuan Branch of the People's Bank of China: "Practice and Knowledge of Sichuan's Banking Reform"/

/Text/ A restructuring of the system of Sichuan People's Bank organizations was gradually carried out in the course of implementing the policy of readjustment rectification and improvement of the national economy during 1980.

Along with the readjustment, restructuring and development of the national economy, banking operations were confronted with many new situations and new problems, with which our existing banking system and methods were incompatible. In the winter of 1979, leading comrades of the provincial party committee discussed with the bank many times the necessity of restructuring the banking system. In accordance with the decision of the provincial party committee and the headquarters of the people's bank, the people's bank organizations in Sichuan began experimenting with restructuring the system. They took reform of the banking system and the readjustment of the national economy as the central tasks and actively launched this work. It is necessary to look back on the practice of restructuring the banking system over the past year to search for patterns so as to bring into play the regulatory role of the bank in readjusting the national economy and in promoting readjustment and development of the national economy.

The reform of Sichuan's banking system during 1980 had the following features: expansion of credit service and start of intermediate and short-term equipment loans to help enterprises tap their latent power and carry out innovations and transformations; reform of the credit planning and management system and implementation of the "centralized planning, decentralized management, linkage of loans to deposits, and control over balance" measures so as to organize funds and use funds more efficiently; change in the fund control system of unified receipt and payment, introduction of business accounting, and trial implementation of measures such as retention of a share of profits, underwriting of costs, and reward according to points recorded, so as to bring the enthusiasm of the banks and their staff into play. The practice over the past year has shown that this experimental reform was in the right direction, it is a road that can be taken; the steps were steady and the results were good; the reform played an active part in bringing the role of banks into play, regulating social production and accelerating economic readjustment; and it was well received by party and government organs and enterprises in all localities.

Initial Results of Reform

The reform of the banking system achieved initial results quickly. Deposits with the bank organizations in the province grew, loans were flexibly utilized, the turnover of funds was accelerated, the quality of work improved, the banks' profits increased, and the reform played an active role in the readjustment and development of the national economy. The main results may be summarized in three aspects:

I. Strengthening the Banks' Regulatory Role, Accelerating the Readjustment and Development of the National Economy

The start of intermediate and short-term equipment loan service was a major reform as well as an important link in strengthening the banks' regulatory role. The people's banks in Sichuan arranged 1,590 projects financed by intermediate and short-term equipment loans and granted loans totalling 388 million yuan during 1980. By the end of last year, 807 projects had been completed and put into operation, thereby increasing the output value by 382 million yuan, and 63 million yuan in loans had been recalled. The remaining projects are expected to go into operation during 1981. On the basis of the economic results estimated item by item, each 100 yuan in loans can increase output value by 298 yuan and increase tax and profits by 64 yuan. Compared with the allocation of funds to build plants, equipment loans take a shorter time, get quick returns and achieve greater gain and better economic results.

The principle of "dealing with each case on its merits and aiding the good" was another important link in strengthening the banks' regulatory role. In 1980, the people's banks in Sichuan moved from the selection of good enterprises to the selection of good products. Taking "meet the needs and produce good-quality, low-cost products" as the standard, in granting loans the banks gave priority to products of good quality and in great demand, aided products that were in short supply, restricted products that were in excessive supply and urged enterprises to produce according to needs. The banks tightened control over loans to finance production of inferior quality and unsalable products, and promoted adjustment and change of products.

II. Arousing the Enthusiasm of Banks for Raising and Utilizing Funds, Improving Fund Management

After implementation of the system of planned management of credit loans--"centralized planning, decentralized management, linkage of loans to deposits, and control over balance"--the banks acquired the power to make unified fund arrangements, to lend more against more deposits, and to regulate loan projects. This plus the direct linkage of deposit and loan service results to retention of a share of profits and bonuses for the staff brought into play the enthusiasm of banks for organizing funds and utilizing funds and improved fund management.

After reform of the banking system, the attitude of attaching no importance to deposits was changed, the banks began to organize deposits as their main line and gained a firm grasp of three aspects: 1)organizing savings; 2) organizing deposits by industrial and commercial enterprises; and 3) organizing deposits of small amounts of money.

After reform of the banking system, the banks made flexible use of funds. They could regulate the targets of industrial and commercial loans by themselves and could use the earmarked funds (transferred from the higher authorities for intermediate and short-term equipment loans) to meet the short-term needs of other enterprises to take their latent power and carry out innovations and transformations. Because of this and also because of the vast number of credit work personnel who went to enterprises to help them improve their operation and management and strengthen their business accounting, the turnover of credit funds was speeded up. In 1978, industrial and commercial credit funds turned over 4.95 times; the turnover was speeded up 0.96 times during 1980. With the turnover of funds speeded up, the saving of funds reached 1.59 billion yuan.

III. Increasing Banks' Internal Economic Dynamics, Promoting Fulfillment of Various Economic Targets

Formerly, the people's banks followed the practice of "eating from the same pot"--unified receipts and payments. The banks' operations and the bank staff's contributions were not linked to the interests of units and individuals, and the principle of material benefits was overlooked. Now, business accounting has been strengthened; retention of a share of profits and underwriting of costs has been tried out; the interests of the state, units and individuals have been combined; power, responsibility and interests have been combined; and retention of a share of profits and reward according to points recorded have been linked to fulfillment of economic targets. These measures increased the banks' internal economic dynamics and aroused the enthusiasm of the bank staff. This found primary expression in three aspects: 1) Widespread interest in the results of bank operations. Credit personnel became interested in both loans and deposits. Accountants became interested in both internal accounting and external use of funds. Even personnel officers, general service personnel and cooks became interested in the way the economic targets of their units were fulfilled. 2) Greater initiative in work, higher attendance rate and efficiency, and better quality of work. In the past, some staff members were unwilling to serve behind busy counters. Now, they began vying with one another to carry the heavy load. In the past, some units used to complain about too much to do and too few employees and they wanted additional personnel. Now, they insist that less personnel do more work. 3) More diligent study. In their spare hours a vast number of staff members have learned a trade from veteran workers, attended evening schools for workers, attended lectures, drilled at posts, and have taken part in periodic tests. In these ways they have studied basic theories, and dug into professional techniques, thereby raising their professional level.

Several Points Learned in Practice

In order to insure that reform of the banking system conforms to and promotes the readjustment and restructuring of the national economy, it is imperative to solve the following problems:

I. Know the correct aim of reform and maintain the reform criteria.

Banks are a comprehensive branch of the national economy and an important lever to regulate the social economy. Reform of the banking system should be centered on the economic results achieved internally by the banks and, more importantly, on their economic effects on society. Thus, reform is the means to the end of gradually operating banks in economic ways and arousing workers' enthusiasm so that the bank activity is made more flexible and the role of banks as a lever is brought into fuller play, thereby promoting readjustment of the national economy and the proportionate development of various branches of the national economy. On the basis of correctly knowing the aim of reform, six criteria should be set to measure the results of reform: 1) whether more funds are accumulated than in the past; 2) whether funds are used more flexibly than in the past; 3) whether the economic results of loans are better than in the past; 4) whether successful experience has been acquired; 5) whether the level of bank management is raised; and 6) whether personnel are trained. In the process of reform, the aim and criteria of reform were repeatedly emphasized and adhered to from beginning to end. As a result, the reform made smooth progress in the correct direction.

II. Overall point of view, overall balance.

Bank work involves many aspects and closely follows policy. It is important to adopt an overall point of view and pay attention to overall balance. For example, to grant intermediate and short-term equipment loans, it is necessary to adopt an overall point of view, uphold the readjustment policy, maintain direction over loans, and insure an overall balance. Provided we adopt an overall point of view, pay attention to overall balance, obtain the necessary information, and strengthen investigation and research, we will be able to avoid blindly granting loans and to achieve good results.

III. Strengthen unified leadership, bring the role of the whole into play.

After reform of the banking system, the power of basic-level banks to make unified arrangement and use of funds has been expanded, making it necessary for the banks at various levels to become independent operating units. In view of this, many banks have set up fund control groups composed of planning, credit, accounting, and savings departments under the concrete leadership of the bank presidents. At the same time, they have instituted some essential systems of management such as fund analysis and control; business accounting, registration and examination; management of large depositors; and cutting expenses. The role of the bank as a whole has been strengthened by unified operations under the bank president and the coordinated activities of specialized departments. The presidents of many banks preside over fund analysis and control meetings and business accounting meetings monthly and every 10 days, respectively, to check up on how funds have been raised and used and how various economic targets have been fulfilled, and to arrange work promptly to solve problems. The president of a bank said with deep feeling: "I have been a bank president for more than 20 years, but I am just now beginning to go over reports, calculate the money supply and analyze fund changes every month and every 10 days. The reform of the banking system has 'forced' me to do it." The presidents of some banks said: "The responsibility of a bank president is now heavy but he has greater power, making it easy for him to work and direct operations." These gratifying changes show that many administrative cadres at banks are advancing along the road to operating banks properly.

Continued Reform Called For

The economic structure of our country is irrational to a severe degree and proportionate relations are thrown into a severe imbalance. This is an outstanding problem calling for urgent solution in our economic life. For this reason, in implementing the eight-character policy in our national economy, we must begin with readjustment and carry out reform centered on readjustment, reform that is subordinate and conducive to readjustment. The pressing matter of the moment confronting banking departments is to strengthen credit management and exercise strict control over money put into circulation so as to insure the smooth progress of economic readjustment.

But, readjustment and reform affect each other and promote each other. Coordination of proportionate relations is the prerequisite for overall reform, while success in certain essential reforms will bring grist to the mill of economic readjustment. Therefore, we should continue to uphold the reforms that have been found effective and consolidate and develop the gains of the reforms. Experiments on new reforms that are essential should be systematically carried out under leadership.

First, we should go a step further and improve our handling of intermediate and short-term equipment loans. The fundamental way out for the Chinese economy is to traverwe a new road of improving economic results. This makes it imperative to tap the latent power of existing enterprises vigorously, develop production of consumer goods energetically and carry out overall reform of the structure of the national economy, centering on production of consumer goods. Banks should grant intermediate and short-term equipment loans mainly to aid production of consumer goods for daily use, to help existing enterprises tap their latent power and carry out innovations and transformations and, in particular, to supply the needs of major cities and to insure the funds necessary for production of products in short supply. When granting loans, we should pay serious attention to economic results and speed up fund turnover. Vigorous support should be given to projects that need less investment, get quick returns and achieve big results, or projects that can produce economic results in 1 or 2 years; after determining the purpose of the loans, we should pay serious attention to the speed and operation of the projects, to increasing income and repayment of loans, and strive to improve the effective use of funds.

Second, in granting all types of loans, we should observe the principle of "dealing with each case on its merits and aiding the good." With a view to placing our economy on a new road of improving economic results, banks granting loans must change the former system of supplying funds and aid the good and restrict the bad. The difference in good and bad should be distinguished by industry, by enterprise, and by product, and it is essential to determine the direction in which loans are used according to the standards of salability, good quality and low costs. Vigorous aid should be given to the promotion and development of good-quality and low-cost products that are in great demand. There should be strict control of loans for products that are of inferior quality, high cost, and do not have a ready market. Adjustment of these products should be pushed. By carrying out this reform successfully banks will be able to bring into fuller play their regulatory role in order to aid end products, cut down on intermediate products and uphold the aim of socialist production.

Third, reform of bank management systems such as planned management of credit lines, business accounting, retention of a share of profits, and underwriting of costs should be continued and improved. To meet the requirements of controlling the money put into circulation and promoting economic readjustment, banks should work out annual and biannual plans for bank credit loans and cash receipt and payment. Banks are required strictly to fulfill the targets of underwriting the credit balance and the targets of intermediate and short-term equipment loans without breaking through them. In order to place business accounting on a more scientific basis, banks have changed the method of computing interest on inter-bank funds from the former practice of computing interest on deposits or borrowed funds to one of computing interest on balance in inter-bank accounts; at the same time, banks have appropriately adjusted the targets of business accounting and examination.

Fourth, bonus management should be strengthened. Reward measures should be enforced according to the requirement of economic readjustment and the unified provisions made by the State Council and the provincial people's government. Bonus lines may not go beyond these provisions. Bonuses for units and individuals should be linked respectively to the way the economic targets have been achieved and the way tasks have been fulfilled. Last year, the people's banks in Sichuan put into effect the practice of rewarding according to points recorded, and the provincial branch of the people's bank ruled that those organizations that did not follow this regulation would be given no bonuses. This system played an active part in implementing the "more pay for more work" principle and preventing egalitarianism. We should continue to uphold, consolidate and improve this system.

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CSO: 4006/410

FINANCE AND BANKING

CONTROLLING MONEY IN CIRCULATION NECESSARY TO READJUSTMENT

Beijing ZHONGGUO JINRONG [CHINA'S FINANCE] in Chinese No 6, 1981 pp 5-6

[Article by ZHONGGUO JINRONG commentator: "Controlling Money in Circulation in the New Direction of the National Economy"]

[Text] The recent conference held by the People's Bank to analyze the nationwide circulation of money, in the spirit of the central work conference and on the basis of analyzing the national economic situation and the circulation of money, proposed that to control the money in circulation we should adhere to the principle of withdrawing money from circulation on the one hand and carefully stimulating the economy on the other. We must continue to tighten control where strict control is called for, and resolutely stimulate what should be stimulated. We should keep a constant watch on the market and be aware of the tightness or ease of money on the market at all times. This is an effective measure for tightening control over the money in circulation as well as an important guiding thought we should follow in our work. It conforms to the requirements of the policy of economic readjustment and to the objective law that circulation of money must be suited to the development of commodity production and commodity circulation.

In the readjustment of our national economy, we should on the one hand cut down on capital construction and expenditure and strive basically for financial balance, credit balance and a stable economy; on the other hand, we should go a step further and adjust the economic structure and improve the economic results on the basis of a stable economy. Our economic readjustment is aimed not only at overcoming our present difficulties and eliminating latent dangers but also at opening a new road of economic development that is suited to the national conditions of China. Traversing this new road, we can achieve coordinated development and steady growth of the economy and create a prosperous cycle in which the people can gain more tangible benefits and bring the superiority of socialism into full play. In accordance with the requirements of economic readjustment, the circulation of money should be controlled in such a way that money put into circulation is brought under strict control, withdrawal of money from circulation is vigorously organized, credit loans are balanced and monetary stability is ensured, and the economy is further stimulated by fully utilizing the economic levers of credit loans and interest rates and by properly regulating the money supply on the market. To solve the problems of imbalance in the national economy, financial deficits and rising prices, it is absolutely essential to tighten control over credit loans and money in circulation, and we should persistently undertake this task. But we should not simply pursue the "tight control" cycle. Our fundamental way out still lies in developing production, adjusting the economic structure and improving economic results. Therefore, simultaneously with cutting down on capital construction and expenditure, we must vigorously support and develop the light and textile industries in order to increase production of consumer goods; give support to the needs centered on production of consumer goods, reorganize the entire industrial structure. and promote reorganization and combination of enterprises; and give support to development of tertiary industries. By doing this, on the basis of developing production and expanding circulation, we can create adequate conditions for withdrawing money from circulation and on the new road of economic development discover new ways to tighten control over money in circulation. Thus, continuing to tighten control over money in circulation while stimulating economic growth does not mean that our tasks will be light but that they will be heavier and our work will be more complicated and difficult, making it necessary for us to redouble our efforts in order to accomplish them.

Some people argue: "If you want to tighten control, you can't stimulate the economy; if you want to stimulate the economy, you must loosen control." This shows that not all comrades have a correct understanding of the relationship between "control" and "stimulation." The contradictory aspects of all things lie in the dielectical unity of opposites. They are indispensable to each other and complement each other. But some comrades are accustomed to thinking in absolute terms. When it comes to "control," they always try to keep things under rigid control, giving little thought to the consequences that follow from an excessively tight money supply. When it comes to "stimulation" they think that all the measures for control can be eased or that breaches can be made at will. It should be understood that control and stimulation are absolutely not antagonistic to each other. The withdrawal of money from circulation in the first quarter was satisfactory. On the one hand, this was the result of balancing financial income and expenditure, balancing credit loans, and cutting expenditures; this was the effect of "control." On the other hand, it was the result of implementing the party's policies on stimulating the growth of the economy, agriculture, the light and textile industries; this was the gain from "stimulation." In our opinion, we should resort to control or stimulation as occasion demands. We must tighten control where tight control is called for, and we must stimulate what should be stimulated. For example, banks must tighten control and supervision over capital spending, administrative expenses, the "four continues," arbitrary expansion of negotiated purchases, raising of negotiated purchase prices, and financial squeeze and misappropriation of credit funds. Banks should vigorously support the development of agricultural production and production of consumer goods and sideline products; they should support the commercial departments in purchasing agricultural and sideline products that are suitable and in demand and in expanding sales and clearing overstocked goods, and in such cases our control measures should be somewhat flexible. Only strict control can achieve credit balance, satisfy the normal needs for construction funds, and stimulate the economy. With the economy stimulated and a prosperous cycle brought about, sources of credit loans can become abundant and the material foundation can be reinforced for withdrawing money from circulation. It should be understood that "stimulation" does not amount to "loosening of control," and that we should give support to stimulation of the economy and on no account can we loosen control. Control and stimulation are two aspects of management. The more it is necessary to stimulate the economy, the more it is necessary to tighten control. Control and stimulation should be appropriate and in balance.

Some people say: "Withdrawal of money from circulation in the first quarter was satisfactory, leaving the amount of banknotes on the market not too large. Is it still necessary to firmly withdraw money from circulation and control the amount of money put into circulation?" These remarks are another indication that these comrades, not understanding the basic situation regarding circulation of money on the market, are unable to make a correct appraisal of the relationship between control and stimulation. The withdrawal of money from circulation was satisfactory in the first quarter and, along with the penetrating implementation of economic readjustment, the circulation of money on the market will gradually become normal. But the situation regarding an overabundance of money on the market has not fundamentally changed either nationwide or regionally. The situation regarding circulation of money on the market is an overall reflection of the state of the national economy. The imbalance in the national economy is a problem that has accumulated over the years; therefore, the task of readjustment can by no means be accomplished in 1 or 2 years. Coordinated development of various proportionate relations in the national economy, fundamental improvement in the financial situation, a fundamental solution of the problem of stabilizing market prices, all-round improvement in market supply--all these problems will have to be solved through sustained efforts throughout the period of economic readjustment. And circulation of money on the market, which comprehensively reflects these situations, can only be gradually normalized along with the solution to these problems. To be sure, the circulation of money is not merely a negative reflection of these situations; the vigorous withdrawal of money from circulation and control over money put into circulation will accelerate the effect and progress of the national economy. Therefore, we must maintain firm control from beginning to end and must not slacken this in the slightest. When we talk about the relationship between control and stimulation, we have in mind stimulation tempered by control. If we undertake control but not firmly, or if we simply loosen our grip, this will have a most undesirable effect on economic readjustment, production development, and the stability of people's livelihood.

Money circulates throughout the country and follows commodities. There are many factors in the outflow and inflow of money between various regions. Economic growth may be faster, commodity supply may be better, and circulation of money may also be better in a certain region. However, this is only in the relative or comparative sense. On the whole, the general effect of an overabundance of banknotes on the market cannot but be felt. For this reason, the withdrawal of money from circulation is an important task that must be undertaken firmly and effectively by all regions without exception.

We still remember what some of our comrades said before the beginning of the year: "The withdrawal of money from circulation is a task of overall importance which cannot be undertaken by the banks alone." The situation regarding withdrawal of money from circulation in the first quarter has dispelled the misgivings on the part of some comrades. We hope that the few comrades who still have such misgivings will also stop worrying. At present, party committees and government at all levels have taken the withdrawal of money from circulation as an important task in implementing the readjustment policy and have strengthened their leadership, and all departments concerned working in coordination have taken many effective measures. Now things will depend on how the departments in charge of money circulation move. We should conscientiously carry out the State Council's "decision to tighten credit control and exercise strict control over money put into circulation." We should continue to tighten control where strict control is called for and resolutely stimulate what should be stimulated. Simultaneously with controlling money put into circulation, we must exert great efforts to organize the withdrawal of money from circulation. We should bring the initiative and enthusiasm of the economic departments into play, carry out thorough investigation and research, and give scope to the role of overall reflection. We should carry out a regular study of socioeconomic conditions and of the conditions of the economic departments, correctly analyze problems that arise in light of the overall interests of the national economy, put forward practical measures and methods from the standpoint of economic results, and do a good job under the leadership of party and government organs and in cooperation with the departments concerned.

The tasks for the second quarter and the second half of the year are very heavy and beset with many difficulties. But there are many favorable conditions. As long as we persistently carry out arduous and penetrating work, we will certainly be able to make great contributions to the task of exercising control over the money put into circulation annually.

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CSO: 4006/410

SPECIALIZED HYDROENERGY PLANNING COMMITTEE SET UP

Beijing SHUILI FADIAN [WATER POWER] in Chinese No 3, 12 Mar 81 p 11

[Text] The Chinese Hydropower Generation Engineering Society held a founding conference for the specialized committee on hydroenergy planning and dynamic economy and an academic discussion meeting in Nanning from 5 to 11 December. Over 100 persons from 52 units of departments, higher educational schools and scientific and research organizations related to the hydroelectric power frontline of each region throughout the nation attended the conference.

During the conference, 35 members were nominated for the first membership on the specialized committee. It was unanimously decided that the main duties of the hydroenergy planning and dynamic economy staff committee should be to develop special topic discussions, exchange of experience and popularization of science, training of personnel and similar academic activities according to the demands of the task of constructing hydroelectric power and plans to develop hydroenergy in our nation, and explore the technical policies related to the major development of hydroelectric power and the feasibility and rationality of major projects. At the present time, special attention should be given to promoting and developing out nation's hydroenergy technology and economy and to developing the function and characteristics of the organization of the society, paying attention to mutual combination and exchange between neighboring scientific fields, and it should serve as a bridge between different departments and fields and provide counseling for policymaking organizations. In 1981, the main activity of the staff committee is to conduct small academic exchanges and organize one or two special topic research classes in coordination with the revision of rules regulating technical and economic computation related to hydroenergy and topics of dynamic economic research in hydroelectric power stations. During the conference an information network for technical and economic information on hydroenergy was set up.

During the academic discussion meeting, comrades of the Guangxi Electric Power bureau systematically described the general situation of planning for the Hongshui River and existing problems. The conference proposed that the nation's related departments and commissions pay attention to the work of development of the Hongshui River, coordinate the plans of related departments, combine them, and give extensive support to the related design units to present feasibility studies, actively organize discussions and reviews, and on this basis, carry out one or more preliminary designs for the first-phase construction so that when the conditions are ripe and the forces are in hand, it can be built in time. As to the basic experience and lessons in hydroenergy planning and technical and economic calculations of hydroenergy, the conference proposed that the nation establish laws and carry out work according to the laws. The state's departments in charge of technical and economic work must strengthen the leadership of each department engaged in technical and economic work, unify research concerned with basic theory and principles, coordinate the technical and economic indicators and parameters, and mutually exchange related information and methods. Related departments must pay attention to training specialized personnel in hydroenergy technology and economy and strengthen scientific research in hydroenergy technology and economy in order to facilitate the progress of the work.

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CSO: 4006/391

ECONOMY OF HYDROELECTRIC, THERMAL POWER STATIONS COMPARED

Beijing SHUILI FADIAN [WATER POWER] in Chinese, No 3, 12 Mar 81 pp 7-11

[Article by Shixican [2457 3356 3503], Cai Ansi [5591 1344 0934], and Lin Xiangyue [2651 5046 1471] of the Hydrology and Hydroelectric Power Station Teaching and Research Group of the Water Conservancy Department of Qinghua University: "The Problems of Making Dynamic and Economic Comparisons of Hydroelectric and Thermal Power Stations"]

[Text] During the 30 years since the founding of the nation, our nation's hydroelectric power construction has realized definite progress. But among the types of energy consumed throughout the nation, the main resources are still coal and petroleum; hydroelectric power constitutes a relatively small proportion. Therefore, regardless of whether we view the present composition of energy consumption or the proportion of the amount of hydroelectric or thermal power generation, we see that the scale of our nation's hydroelectric power construction and our nation's rich water energy resources are not well matched.

Why has hydroelectric power not developed faster? One important reason is that for a long time, the study of the economy of hydroelectric power construction in producing electric power was not given the proper emphasis. Scientific research and statistical analysis concerning the study of the economy of hydroelectric power did not develop well, and even related standards lacked the necessary rules concerning the study of the economy of hydroelectric power. This situation should not continue and it must be changed quickly.

I. Use of the Number of Years for Compensation and for Return on Investment

In the economic comparison of development plans for electric power construction projects, each plan must have the following comparable conditions: Each plan must satisfy the demands of development of the national economy; must be technically feasible; must be assured the required manpower, material and capital; and must be compared on the same basis regarding consumption costs, price index and time factors. Otherwise, incorrect conclusions may be drawn from the comparison.

To prove the economic results of the plans, they must take into account the quantity of the product to be provided (amount of power generated, amount of water supply), the quality (percentage of assurance, voltage, cycles, water quality), productivity (installed capacity, amount of flow of water drawn), raw material and fuel consumption, actual indicators of flooding and moving, and the economic indicators expressed in monetary units of investment, cost, profit, and the number of years for a return on investment of the project. Therefore, there should be a whole set of technical and economic indicators for use to measure the economic results of the plans on an overall basis. In this system of indicators, the number of years for a return on the entire investment and the number of years for compensation of the investment balance are two relatively important comprehensive indicators. Each of these indicators has its use and they should not be confused.

To account for the economic results of labor required and labor consumption on an overall basis, when making an economic comparison of different plans in the combined electric power system of both hydroelectric and thermal power stations (for example, when making an economic comparison of plans for the installed capacity and plans for different reservoir parameters), the method of the number of years for compensation of investment differences of the system was used. In recent years, some people have also used the number of years for a return on total investment of the hydroelectric power station or the number of years of retrieval of the differences in investment for hydroelectric power stations as the criteria for economic comparison of the plans. The formula for calculating the number of years for a return of total investment is:

$$T_{\text{return}} = \frac{\text{investment}}{\text{net income}} = \frac{\text{amount of investment}}{\text{gross gain - annual cost}}$$

The number of years for a return on total investment in an engineering project is an important indicator to measure the economic results of investment in an engineering project, but it cannot serve as a criteria for economic comparison of plans. This is because as the scale of the hydroelectric power station grows, the rate of increase in investment will speed up, and after reaching a certain scale, the rate of increase of gain will become slower and slower; if in an economic comparison the plan with the shortest number of years for a return on total investment is chosen as the best plan, then the scale of the hydroelectric power station may be too small.

Using the number of years of retrieval of investment differences between two plans for a hydroelectric power station, $T_{\text{return}} = \frac{\text{Investment Differential}}{\text{Net Income Differential}}$ as the criteria for comparing the plans is similar in form to the method of using the number of years of compensation, but they are different in principle in two points: 1) The method of the number of years of compensation (or calculated expenditure method) is used to measure the merits of a plan based on the economic results of the entire system of electric power generation consisting of hydroelectric and thermal power stations. The method of the number of years of retrieval of investment differences of hydroelectric power stations does not consider the effects brought about by the economic gain to thermal power stations in the system as a result of a change in the plans of the hydroelectric power station. Therefore, the best plan viewed simply on the basis of the economic results of the hydroelectric power station itself may not be the best plan for the entire electric power system consisting of hydroelectric and thermal power stations. 2) The method of the number of years of compensation has a prerequisite requiring that the annual demands of industry and agriculture for electric power load and generated capacity are satisfied jointly by hydroelectric and thermal power stations in the system. It is a kind of criteria for the most suitable plan for the selection of hydroelectric and thermal power stations and for dynamic and economic comparison of hydroelectric and thermal power stations of the electric power system. The method of the number of years of retrieval of the investment differences between two plans for hydroelectric power stations does not take into consideration how to satisfy the needs of the load and the generation capacity of the system, and it does not make a dynamic and economic comparison with the thermal power stations in the system, so it cannot be used as the criteria for the selection of the most suitable plan for hydroelectric and thermal power stations in the system.

Therefore, the indicator of the number of years for the return on total investment of a hydroelectric power station and the indicator of the number of years of retrieval of investment differences between two plans for a hydroelectric power station are both unsuitable for comparing the dynamic and economic properties of plans for the generation of electric power by hydroelectric and thermal power stations and for use as the criteria for economic comparison to determine the rational scale of hydroelectric and thermal power stations. But the number of years for return on total investment in a power station serves an important function in mutual comparison and cross-reference among power stations, and it is an important indicator to measure the economic results of investment.

II. Accounting for the Investment Indicators

Investment in capital construction is a comprehensive indicator of the manpower, materials and financial capital required to realize the capital construction project expressed in monetary units. It can generally reflect the material labor used by the engineering project. After deducting the retrieval cost from the investment in capital construction of a power station and floating capital investment, we arrive at the building cost, which constitutes the fixed capital of the power stations. According to preliminary statistics, the total building cost of our nation's hydroelectric power stations averages about 87 percent of the total investment. Therefore, accounting for the capital used by the power station should be based on the building cost. In this article, the traditional term construction investment is still used, but it refers to the cost of building construction.

When making an economic comparison of the plans for hydroelectric and thermal power generation, calculation of the investment in the hydroelectric and thermal power station (plant) should be made on the same basis to assure the comparability of the plans. But in the past, the investments in hydroelectric power stations and in thermal power plants were not calculated on the same basis, and thus the investment in hydroelectric power stations ordinarily appeared to be much greater than the investment in a thermal power plant of the same capacity, giving rise to the mistaken concept that the average investment per kilowatt of installed capacity of a hydroelectric power station was far greater than that of a thermal power plant; in the economic comparison of the hydroelectric power station and the thermal power plant, the hydroelectric power station is at a disadvantage, and to a definite degree, this has affected the development of hydroelectric power construction. Here there are mainly three problems: 1) In the construction of large, medium and small hydroelectric power stations, most possess comprehensive gains in flood prevention, irrigation, water supply or shipping. But when calculating the investment in construction, the necessary investment distribution among the various sectors of comprehensive utilization of water conservancy resources was not made or was seldom made, and thus the investment in hydroelectric power stations appeared larger. 2) When calculating the investment in thermal power stations, the necessary investment for the construction of coal mines and railroad construction was not included, and thus the numerical value of the calculated investment for thermal power plants was smaller. 3) Because the number of years of construction necessary for the development of coal mines directly related to the thermal power plant were not included, it was generally believed that the number of years required for the construction of a hydroelectric power station was much longer than for a thermal power plant.

For these reasons, in electric power construction, the view that "the investment in a hydroelectric power station is much larger than a thermal power station and that the period of construction is much longer than that of the thermal power station" has been popular for a long time. This does not coincide with the actual situation.

In the following, several problems in the calculation of investment will be separately discussed:

1. Problem of Distribution of Investment in Construction of a Hydroelectric Power Station

A hydroelectric power station project built for comprehensive utilization not only provides the gain of power generation, but it also provides comprehensive gain in many aspects such as flood prevention, irrigation, water supply, shipping, and fish culture. In examining the economic results of investment of such a project, especially when compared with the economic results of thermal power, it is obvious that the gains in every aspect should be considered, not considering only the gain of hydroelectric power generation and ignoring the economic gains in other aspects. When separately evaluating the economic results of each water department of the project, the economic gain obtained by each department from this project must be calculated separately, and at the same time, the investment in this project should be rationally dispersed among all sectors.

In the economic calculation of projects of comprehensive gain, we must disperse the investment in the project so as to analyze in greater detail the investment gain of the entire project and account for the economic result of investment of each department using water especially, so that the investment borne by the hydroelectric power station is more rational; thus, in making economic comparisons of the development plans of hydroelectric and thermal power generation, a more correct evaluation can be made. If we believe that since under socialist conditions, investments in construction projects are all funded by the state anyway and that it is not necessary to expend efforts to study the problem of dispersion of investment and if we include all investment in the cost of hydroelectric power stations, creating a false view of large investment in hydroelectric power and giving rise to an incorrect conclusion unfavorable to the development of hydroelectric power, then this will produce an unfavorable effect upon the development of the entire national economy. In addition, if we do not consider dispersion of investment, if we do not carry out the necessary analysis of the economic results of investment for each department using water, then sometimes inappropriate and overly high design standards and demands upon departments using water will be proposed, and this will also inappropriately enlarge the scale and investment in the project. Therefore, implementing a rational dispersion of investment is entirely necessary. This is needed not only in doing things according to economic patterns, it is also beneficial to coordinating the conflicts among the departments using water and to stimulating each department to propose rational design standards and demands in planning and design.

Many methods have been proposed to disperse investment in key hydroelectric power construction projects; for example: 1) proportional dispersion according to the economic gain obtained by each department using water; 2) proportional dispersion according to the investment required by substituting measures of each department possessing the same gain; 3) proportional dispersion of investment required by each construction project when developing single projects of each department; 4) proportional distribution of the capacity of the reservoir used by each department; 5) proportional dispersion of the amount of water utilized by each department, 6) proportional dispersion of the investment in specialized buildings of each department of the construction project. There are also other methods, which will not be listed here.

Among the various methods of dispersion of investment described above, the first method, in principle, is relatively more rational: it is to allow the investment borne by each department to possess the same investment gain coefficient; but the difficulty is that the calculation of the gain of some departments is more complex, and the calculation of the gain of each department in flood prevention, electric power generation, irrigation, water supply, and shipping lacks a unified and comparable foundation both in principle and method. But to correctly evaluate the economic gain of investment in a construction project, including the unavoidable calculation of the economic gain of each department, the calculations should be gradually perfected and coordinated on the presently available basis of the methods for calculating the gain of each department. All of the other methods have shortcomings, but under specific conditions they can also be tried.

2. The Problem of Including Corresponding Investment of Coal Mines and Railroads in the Investment of Thermal Power Plants

The energy for our nation's thermal power plants is mainly coal; the amount of coal used for generation of electric power constitutes about one-sixth of the total amount of coal produced, so power generation is one of the major users of coal. In the past, when making economic comparisons of hydroelectric and thermal power stations (plants), only direct investment in the thermal power plants themselves was calculated, while the consumption of coal used for fuel each year was included in the annual operating costs of the thermal power plants according to the price of coal shipped to the plants. Because of the difference between price and value, the price of coal was slightly lower, and this shifted a portion of the net income which should have been obtained from the production of coal mines to the thermal power plants, and thus exaggerated the economic gain of the thermal power plants.

Because coal is a necessary gross commodity needed for consumption to maintain the production of the thermal power plants, especially when coal and railroad shipping in our nation are both in tight supply, building a new large-scale thermal power plant correspondingly requires building new or expanding some coal pits and coal mines and increasing the investment in railroad transportation. Therefore, the construction or expansion of coal mines and railroads should be regarded as a component part of a newly built thermal power plant system; the investment in coal mines and railroads built to supply energy to the thermal power plants should be included in the investment of the thermal power plants. If we calculate on the basis of an annual consumption of 3.5 million tons of raw coal to produce 1 million kilowatts by the thermal power plant, and the investment in capital construction of the coal mine per ton of coal is 100 yuan, then building a new coal mine producing an annual yield of 3.5 million tons requires about 350 million yuan of investment in capital construction. For each kilowatt of installed capacity of the thermal power plant, an increase of 350 yuan of investment in coal mines is needed, and adding the corresponding investment in railroads, the investment per kilowatt of the thermal power plant system approaches 1,000 yuan. If we consider dispersion of the investment in public construction projects of the hydroelectric power network and thus reduce the investment borne by the hydroelectric power station, then the investment per kilowatt of hydroelectric power and of thermal power is not too different.

3. The Time Factor in Investment Accumulation

Whether for a hydroelectric power station or a thermal power plant, in calculating the investment, we should include in the construction period the accumulated loss in investment produced by failure of the investment to develop, so as to assure comparability of each plan according to the time factor. Under ordinary situations, the cumulative loss in investment in hydroelectric stations is larger because the construction period is longer, but in the calculations of a thermal power plant system, we should also include the corresponding cumulative loss in investment of the coal mine, and the construction period of the coal mine is also relatively long.

The effects of investment during the period of construction and the time factor should include the following three parts: 1) The loss in the accumulation of capital for construction and coperation which could not be given to society to provide gain; the loss of this portion can be calculated by the investment gain coefficient demanded and the capital used. 2) The loss produced by visible and invisible loss of buildings and facilities already built before they begin production; this part of the economic loss can be estimated by depreciation of the buildings and facilities already built. 3) The increased cost of construction due to an extension of the construction time; for example, wages of construction personnel, administrative costs, and maintenance costs of various enterprises;

this part of the loss should be estimated based on actual situations and calculated in the investment plans for each year during the construction period.

Consideration of the time factor of investment accumulation coincides with the objective economic pattern and assures the comparability of each plan in economic comparison; it is beneficial to promoting and hastening the progress of construction, shortening the time of construction, and it can spur part of the construction to enter into production earlier during the construction period so that the investment can produce a gain even faster and increase the economic result of investment.

III. Accounting for Annual Production Costs

Annual production costs are the total of the various costs expended each year by the enterprises in the production of products. It approximately reflects labor consumption in production and is the accounting reference of unit cost of products of enterprises. It is also an important indicator for a comparison of the plans of hydroelectric and thermal power stations (plants).

In the cost of electric power sales of each electric power network in our nation, fuel costs constitute 56 percent and depreciation costs constitute about 20 percent. In the cost of electric power generation by the thermal power plant, fuel costs constitute 60 to 70 percent and even more. In the cost of electric power generation by a hydroelectric power station, depreciation constitutes about 60 percent and more. Therefore, these two costs affect the economic comparison of the plans of hydroelectric and thermal electric power stations (plants) to a great extent, and it is necessary to give them full attention.

1. The Problem of Depreciation of Fixed Assets

Depreciation of fixed assets includes basic depreciation and depreciation due to major repairs. These two costs constitute 16 percent and 4 percent, respectively, of the cost of electric power sales.

Basic depreciation is the value of fixed assets expressed in monetary units transferred to the products due to visible or invisible losses. The basic depreciation of fixed assets currently in force in our nation generally does not take into consideration the invisible losses, and basically, the withdrawal and deposit each year are calculated by the number of years of the fixed assets used.

From 1971 to 1977, the average basic depreciation of our nation's electric power industry was about 3 percent, and the basic depreciation of certain hydroelectric power stations was only 2 percent. If we consider invisible loss, the number of years of depreciation of fixed assets should be shorter than the useful life, i.e., the basic depreciation rate should appropriately increase.

2. Problem of Fuel Costs in Thermal Power Plants

In the cost of electric power generation by thermal power plants in our nation, the proportion of fuel costs is about 72 percent in high-voltage heat supply type power plants and high-voltage steam condensation type power plants, and about 62 percent in sub-high-voltage steam condensation type power plants. The fuel costs as a proportion of the cost of electric power generation are not only related to the type of power plant, but are also related to the scale of the electric power plant. For example, the fuel consumption cost in a thermal power plant with a single generator capacity of 200,000 to 300,000 kilowatts is about 56 percent, while that in a thermal power plant with a single generator capacity of 100,000 kilowatts is about 76 percent, and in a thermal power plant with a single generator capacity of 25,000 to 50,000 kilowatts it is about 80 percent. It can thus be seen that in the economic comparison of plans for hydroelectric and thermal power stations, full attention must be paid to comparing and selecting the type and scale of the plants to replace the thermal power plant.

Hydroelectric power stations with a definite regulatory reservoir capacity frequency serve to regulate peaks and frequency in the electric power system. To assure comparability of the plans, the plans in which a thermal electric power plant is substituted should also correspondingly consider the consumption of standard coal required in regulating the peaks and frequencies. For example, in 1976 there were two electric power systems, in which the number of hours of utilization of installed thermal power generation was 3,300 hours and 6,080 hours, respectively, while in the consumption of standard coal for electricity generation, the former was 1.48 times that of the latter. In addition, if we include the corresponding investment in coal mines and railroads in the investment of thermal power generation, then in calculating the annual operating costs of thermal power generation, we cannot calculate the cost of coal consumption by the thermal power plant according to the price of coal shipped to the plant, but we must calculate the production cost and the transportation cost of coal.

IV. Problem of the Investment Gain Coefficient

The investment gain coefficient is an important economic indicator in the economic comparison of plans for hydroelectric and thermal power stations. In 1956, the Ministry of Electric Power Industry issued dynamic design standards for hydroelectric power stations and it suggested the use of a compensation of 10 to 15 years, i.e., the established investment gain coefficient was 0.1 to 0.067. Later, some units used a compensation of 5 to 7 years in planning and design, i.e., an investment gain coefficient of 0.15. As to the investment gain coefficient which electric power departments should use, this still has not been standardized, and it should be established as soon as possible. We believe the following factors should be considered:

1. When establishing the investment gain coefficient of each department and enterprise, we should refer to the average investment gain coefficients actually realized by the various material production departments of the national economy and the trends in their development and evolution. For example, in the 1960's, the average number of years of investment retrieval of the entire society of our nation was about 6 years, i.e., the entire society's average investment gain coefficient was about 0.16. The concerned economic leadership departments can establish the average investment gain coefficient of the entire society and of industrial departments in accordance with the demands of development and using

the actual conditions of economic development of our nation as important reference factors for establishing the investment gain coefficients of the departments of each sector.

2. In the development of our national economy, as electric power is the first to be developed, the demands upon the investment gain coefficient of the electric power department can be slightly lower than for other material production departments to facilitate development of the electric power industry as a priority.

3. Considering the rational utilization and the long-range benefits of energy, hydroelectric power should be developed extensively in the construction of electric power; therefore, when making economic comparisons of hydroelectric and thermal power, we can use slightly lower investment gain coefficients to stimulate the development of hydropower for electric power generation so that hydroenergy resources can be more fully utilized, thus conserving coal and petroleum resources.

4. The established investment gain coefficient should have a definite scale of variation so that suitable indicators can be selected in accordance with the characteristics of various aspects of the energy, natural and economic conditions of different regions of our nation.

V. Conclusion

1. Our nation's hydroenergy resources are very rich, but at present only 2.5 percent have been developed. Some of the reasons were that economic studies for electric power construction were not given the proper emphasis, economic accounting and the method of analysis did not completely coincide with the actual objective situation and the economic patterns, and for a long time the incorrect view prevailed that "even though hydropower generation is good, it requires a much larger investment than thermal power generation," thus affecting the development of hydroelectric construction.

2. To simultaneously calculate the economic results of labor consumption and labor used, in the past when doing economic comparisons of proposals for electric power construction we have generally used the method of the term of repayment and the least expenditure method of calculation of investment differences of the systems. Although these have had shortcomings, they are relatively rational, and the annual expenditure method of calculation is more convenient to use than the method of the term of repayment. Although the number of years of return on total investment or the number of years of retrieval of investment differences are important technical economic indicators, they are unsuitable as standards for judging the merits of the plans in economic comparison of hydroelectric and thermal power plants.

3. When carrying out dynamic economic comparison of the plans for hydroelectric and thermal power stations (plants), the investment in hydroelectric power and thermal power generation and the scope of calculating the production costs should all begin from the supply of energy and extend to the time when electric power is transported to the region of electric power users. For the hydroelectric power station, accounting for the investment and the operating costs which should be borne should take into consideration related reservoir engineering projects,

hydroelectric power plants and transmission and transformer power construction as a unified hydroelectric station system. For thermal power generation, accounting for the investment and the operating costs which should be borne should take into consideration related coal mines, railroads, thermal power plants, transmission and transformer power engineering construction as one thermal power station system.

4. The magnitude of investment gain coefficients to be used by the electric power departments still lacks sufficient study, and efforts should be organized to conscientiously carry out research.

5. In the work of electric power construction, economic study should be strengthened greatly, and scientific research in related fields should be actively developed. In the present situation, the various problems existing in past theoretical and analytic work should be summarized, and at the same time, the various economic theories and methods that benefit our nation's socialist construction should be conscientiously absorbed, so that hopefully we can finally establish a set of standards and calculation methods for economic comparison that suit the actual situation of construction of our nation's electric power industry.

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CSO: 4006/391

ENERGY

MERITS OF PUMPED STORAGE POWER STATIONS DISCUSSED

Beijing SHUILI FADIAN [WATER POWER] in Chinese No 3, 12 Mar 81 pp 40-42

[Article by Wang Yifu [3769 0122 1788] of the Huadong Survey and Design Institute of the Ministry of Electric Power Industry: "Clarification of Several Problems Related to Our Nation's Construction of Pumped Storage Power Stations"]

[Text] In some regions in our nation, especially in northern China, eastern China and the northeastern regions, where the number of large peak regulating hydroelectric power stations which can be newly built is small, we should begin research in the construction of pumped storage power stations. But some comrades have raised some questions concerning our nation's construction of pumped storage power stations. They can be condensed into five questions. Some opinions are presented to clarify these questions.

I. Our Nation's Hydroenergy Resources Are Rich and the Degree of Exploitation and Utilization Is Low; Isn't It Too Early Now To Talk About Building Pumped Storage Power Stations?

The reserve of hydroenergy resources is indeed very rich. Calculating the amount of hydroenergy resources that can possibly be exploited and utilized for power generation, they are equivalent to the annual generation of 1.9 trillion kilowatt-hours, but the amount developed so far is less than 3 percent, and the rate of utilization is also indeed very low. They are also unevenly distributed among the regions of our nation. They are mostly concentrated in the southwest, south-central and northwest regions, constituting 94.4 percent, whereas the northern, northeastern and the eastern regions have only 5.6 percent. Coal resources in northern China are of high quality, the reserve is large, and they lead the nation, but hydroelectric energy resources are lacking; the latter are mainly concentrated in the middle reaches of the Yellow River. The development of that section of the river involves the problems of comprehensive utilization for flood prevention, irrigation, power generation and blocking sand, and it is far from the major users of electricity in the regions of Beijing, Tianjin and Tangshan. Therefore, the peak regulating capacity of the electric power network in northern China must depend on large pumped storage power stations and large thermal power stations used specifically to regulate peaks. The northeastern and eastern regions are our nation's important industrial and agricultural bases, and they lead the nation in the amount of electricity generated by the two electric power networks. But the two regions are not self-sufficient in coal, which has to be imported from other regions. The hydroelectric power stations already built or being built utilize 25.7 percent of the hydroenergy resources that may be developed in the northeast and 20.6 percent in eastern China. Of the hydroenergy resources that have not been exploited yet, some power stations have been asked by other departments using water to limit their operations, and thus hydroelectric power cannot be completely used for regulating peaks. Some electric power stations are far from the load center, and require ultrahigh voltage transmission and transformer equipment. Some reservoirs have displaced many people, the area of cultivated land being submerged is large, construction investment has been increased, and some projects can hardly be built. In the northeast, some power stations are situated on rivers that form international borders, and they cannot be easily developed right now. Therefore, in the near future, the number of large hydroelectric power stations that can be built and can share the work of regulating the peaks of the main networks in these two regions is few. Also, an economic study of similar types of peak regulating power stations (including pumped storage power station) is needed as part of the long-range planning for the electrical power system in order to select the best. Therefore, at present, we should firmly undertake to do well the preliminary work for river hydroelectric power stations and pumped storage power stations, clearly understand their conditions of construction and economic results, and based on need and possibility, build them selectively; it is not too early to carry out this urgent task in today's hydroelectric power construction.

II. The Pumped Storage Power Station Is a Type of Electric Energy Conversion and Storage Measure Which Consumes Energy. When Our Nation's Supply Is Tight and Capital Is Limited, Do We Have the Strength To Build Pumped Storage Power Stations?

The present pumped storage power station total efficiency is between 70 and 75 percent. It is commonly said that pumped storage power stations use 3 to 4 kilowatt-hours in exchange for providing 2 to 3 kilowatt-hours of electricity. At first glance this seems to be an irrational consumption of electrical energy, but actually it is not so simple. Let us first examine the seasonal regulation by the pure storage power station. During the flooding period, it utilizes the surplus force of the electric power system to pump water, converting electric energy into potential energy from water stored in the reservoirs of mountain valleys. When the dry period arrives, the water is used to generate electricity to supply the electric power system. If the surplus force during the flooding period is not utilized, it will be wasted, and the electric energy produced during the dry period is like an assured force of the hydroelectric power station, it has the same value of utilization. Obviously, this converted economic value cannot be measured only superficially in numerical values.

The daily (weekly) regulatory pumped storage power station's working principle is also the same. It utilizes the surplus capacity to pump water and store energy during the low trough load period of the thermal power plant or nuclear power station, and generates electricity when the load is at high peak. Because the thermal efficiency of the basic load thermal power plant (or nuclear station) is different from the peak load thermal power plant (the unit consumption of coal of the basic load is lower than the peak load), according to foreign data, "even when the efficiency of one cycle of a pure storage power station is 70 to 75 percent (calculating the electrical energy), the fuel energy consumed by the high-efficiency pump may approach or be smaller than the fuel consumed by the less efficient peak load thermal electric power generator substituting for the storage power station's generators in generating electricity." Utilizing the surplus forces of the basic load to pump water for generation of electricity at the time of peak load also means consuming the fuel of which we have rich reserves (coal) and conserving fuel that is in short supply (oil and gas).

Furthermore, the rate of heat loss of a thermal power station or a nuclear power station, when other conditions (such as characteristics of the generators, load characteristics, operating conditions, fuel quality, etc) are the same, decreases as the capacity of the power station (the ratio between the average output of the power station within a definite period and established capacity) increases. A U.S. report shows the heat loss under different average output of some nuclear power stations and coal-fired power stations at mines. The figures have been selected, converted and listed in the following table.

附　表

1 项　　　目	2 抽水用电来源	
	3 核能电站	矿口燃煤电厂 4
5 出力为90%时热耗率平均值(大卡/度)	2625	2250
6 折合标准煤耗(克/度)	375	322
7 出力为60%时热耗率平均值(大卡/度)	4625	4125
8 折合标准煤耗(克/度)	661	591
9 热耗率差额(可供抽水用)(大卡/度)	2000	1875
10 折合标准煤耗(克/度)	286	269
11 抽水蓄能电站总效率	75%	75%
12 抽水蓄能电站热耗当量(大卡/度)	2667	2500
13 折合标准煤耗(克/度)	381	357

注：附表资料来源：Henry H.Chen, "Optimization of Pumped Storage Projects"，《American Power Conference》Vol. 38, 1976.

1. Item
2. Source of electricity for pumping
3. Nuclear power station
4. Coal-fired power plants at mines
5. Average value of heat loss at 90 percent output (kilocalorie/kilowatt-hour)
6. Converted to loss of standard coal (gram/kilowatt-hour)
7. Average value of heat loss at 60 percent output (kilocalorie/kilowatt-hour)
8. Converted to loss of standard coal (gram/kilowatt-hour)
9. Difference in heat loss (can be used for pumping water) (kilocalorie/kilowatt-hour)
10. Converted to loss of standard coal (gram/kilowatt-hour)
11. Total efficiency of pumped storage power station
12. Equivalent value of heat loss of pumped storage power station (kilocalorie/kilowatt-hour)
13. Converted to loss of standard coal (gram/kilowatt-hour)

Source of data: Henry H. Chen: "Optimization of Pumped Storage Projects," "American Power Conference," Vol 38, 1976.

We can see from the accompanying table that when the thermal power plant or the nuclear power station in the electric power system is operating at a reduced output, the fuel consumed for each kilowatt-hour of electricity increases a lot; therefore, the generators should operate evenly and close to full load to conserve fuel costs. But there is always a difference between the high peak and the low trough on the load graph. At low trough, several thermal power plants or nuclear power stations must also operate at reduced output; at some thermal power plants the generators even have to be shut off and wait to be turned on again just before the high peak, thus increasing unit consumption of coal and creating invisible waste. If the system has a pumped storage power station, then when the load is at a low trough it can use electricity to pump water, and thus the operating condition of the thermal (nuclear) power plants can be improved, their capacity can be increased, and their unit coal consumption can be lowered. Therefore, even though storage power stations use electricity to pump water, partial compensation can be obtained from the avoidance of invisible waste by related power stations.

III. Our Nation's Electricity Pricing System Is Different From That of Industrially Developed Nations; We Do Not Differentiate Between Peak and Base Loads. Is There Any Economic Gain in Developing the Pumped Storage Power Station in Our Nation?

The price of electricity in foreign nations varies in different seasons and the time of use of electricity. For example, in the joint system in Western Europe, generally speaking, the price of electricity at peak load during the daytime in winter is about three times the price at night. The price of electricity during the peak in the daytime in summer is about two times that at night. Because of the difference in the structure of the power source of the electricity network of each nation participating in the joint operation and the different cost of generating electricity, the prices of exchange of electric power between the networks are also not entirely uniform. For example, Switzerland is at the center of the joint system, and it owns a massive amount of seasonally adjusted electric energy; therefore at night it takes in the cheapest low trough electrical energy from foreign nations for domestic consumption, including electricity used by the storage power stations, while during the daytime at high peak, the seasonally adjusted hydroelectric power station and storage power station generate electricity to supply their own nation and foreign nations. The quantity, time and price of exchange electric power between the systems are determined by normal commercial negotiation between the power companies. In the costs of generation of electricity of the storage power station, the cost for pumping water is about 40 to 50 percent; adding fixed costs of depreciation, operation and maintenance, the cost is still much cheaper than other peak load power sources, so it is competitive. For the other power systems, at the low trough they can increase output of electric power and thus reduce cost, while at high peak load they can buy electric power at a lower cost than producing it themselves and thus realize a gain, and this is profoundly welcomed.

In the unified power system, as the load increases, whether to increase the building of pumped storage power stations or other types of peak regulating power stations must be considered on the basis of the technical and economic results of the entire system for comparison and selection. Besides considering river hydroelectric stations as a priority, in foreign nations, there are also fast start-up generators used specifically for regulating peak loads and generators of the condensed steam type which can operate at variable voltages. Sometimes regular large-scale thermal power generators have to be used to share the burden of the mid-load or the peak load. Economic comparison of the peak regulating thermal power plant with the pumped storage power station shows that the main differences are: the peak regulating thermal power plant's building cost per kilowatt-hour (not including costs of coal mines, shipping equipment) is lower, while the annual costs are higher. The annual costs include fixed costs (depreciation, operation, maintenance, major repairs) and fuel costs that increase or decrease according to the amount of electricity generated. The building cost per kilowatt-hour of the pure pumped storage power station is slightly higher than that of the ordinary thermal power plant, but the annual costs are lower. The annual costs also include fixed costs and the pumping costs that vary with the amount of electricity generated.

According to statistics of foreign nations, the construction cost per kilowatt-hour of the pure storage power station is about 100 to 130 percent of the peak regulating thermal power plant; the civil engineering construction part constitutes a larger proportion, the useful life of the electromechanical facilities is also longer, and therefore its basic depreciation and fixed costs are all lower than those of peak regulating thermal power plants. The pumping costs of storage power stations are generally believed to include only calculations of the direct increases in fuel costs to generate electricity used for the supply of pumping water for the power station (because other expenditures do not increase or decrease with the use of electricity for pumping water). This fuel cost approaches or is smaller than the fuel cost of the peak regulating thermal power plant. In addition, the economic gain obtained from the use of electricity supplied by the related power station for pumping water, the gain from the adjustment of frequency by the storage power station, the gain from supplying zero work output, the gain from serving as a backup in case of accidents or loss in receiving and transmitting electric power if the storage power station is relatively far away from the power source for pumping water and the load center, must all be calculated item by item. The entire economic analysis frequently shows that the pumped storage power station provides the cheapest and most reliable electric power to satisfy the need for regulating peaks, and realizes many gains for the system.

IV. The Development of Pumped Storage Power Stations Abroad Began With the Mixed Type and Then Developed Into the Pure Storage Type. Should Our Nation Also Develop the Mixed Type First and Then the Pure Storage Power Station?

Checking the course of development of pumped storage projects of each nation, we see that there is no set pattern as to the type of power station. At the end of the last century, Switzerland built the world's first seasonal regulatory pure storage power station. Later, the comprehensive utilization hydroelectric power stations of many nations could not completely operate according to the needs of the electric power system because of the demands of irrigation, shipping and water supply departments, and so pumped storage facilities became mixed power stations to respond to the need for regulating peaks. Some hydroelectric power stations added pumped storage generators to utilize surplus output during low loads in the system and to increase the capability to regulate peaks. The United States has built the most pumped storage power stations. Before the 1950's, two hydroelectric power stations already built were utilized to install reversible generators that could pump water and generate electricity in order to obtain experience in design, manufacturing and operation. After the experiments were successful, pure storage power stations developed rapidly on a large scale. The three pumped storage power stations built in the early days in Japan are equipped with normal hydraulic turbine generators and electric water pumps. During the past 20 years, because the number of hydroelectric power stations on rivers worth developing has lessened, in accordance with the needs and possibilities of rebuilding and expanding the existing hydroelectric power stations, we should build new storage power stations in a big way.

The pumping and generating facilities of mixed power stations can fully utilize the hydraulic buildings and facilities of power stations. If the costs of damming rivers and reservoirs are not included, the unit building cost is cheaper than that of pure storage power stations of the same capacity and using the same flood peak. During the flooding period, some additional seasonal electric power can be obtained. This is a favorable condition of the mixed storage power station. But it also has an unfavorable side. First, it is limited by the conditions of natural resources and social and economic conditions. Its geographical position and the scale of its construction are unlike those of the pure storage power station, which are almost unrestrained by the limitations of the river and water flow and which can be selected more widely. In our nation's eastern and northern regions, the number of mixed storage power stations which can be built for the major networks is few; their flood peak is mostly under 100 meters. A low flood peak has a large amount of flow, and the corresponding storage generators, regulatory reservoirs and water pipes and channels must all be larger; therefore, the cost is higher than the pure storage power stations with a high flood peak. Second, the falling depth of reservoirs of hydroelectric power stations over rivers is generally 40 to 50 percent of the highest flood peak. Such a large variation if not readjusted frequently renders the single-speed reversible generator unsuitable, and two-speed generators have to be used, thus increasing the building cost of the generator and the cost of maintenance. The best sites for hydroelectric power stations on rivers frequently are far away from the load center and the pumping power source. Sometimes they are too remote and the loss in power transmission is too large, and so it is not suitable for them to add storage generators.

Pure storage power stations do not rely on the natural falling differences and the discharge, there are more choices of sites for the stations, the reservoir capacity is smaller, and the loss of area covered by water is smaller. The design standards for hydraulic buildings are lower and large spillways are not needed. During construction, expensive flow guideways are not needed, construction is not affected by flood water, and construction can be carried out throughout the year. Therefore, the construction cost per kilowatt-hour of pure storage power stations, according to statistics of building such power stations by foreign nations, is only 40 to 50 percent that of power stations on rivers, and the unit cost for power generation including the cost of pumping is only slightly higher for storage power stations. The statistics of domestic plans present a similar picture. In recent years, the unit construction cost of power stations on rivers has differed more markedly from that of the pure storage power stations because of the relatively large increase in the cost of moving reservoirs.

The building cost of the pure pumped storage power station when the capacity and the storage capacity are the same generally drops as the flood peak heightens. The higher the effective flood peak, the smaller the flow and the reservoir capacity required, and therefore the unit building cost is lower. Therefore, foreign pure storage power stations are developing toward a high flood peak: the highest flood peak of mixed flow type pump and hydraulic generators already reaches over 500 meters. But we cannot say accordingly that "the water source of the storage power station must be above 500 meters," because the height of the water source is only one factor that determines the building cost of the power station; it is not the only factor. For example, our nation is still at the beginning period of building storage power stations, we lack experience in the design and manufacturing of reversible water pump and hydraulic generators; we must start out from this actual situation, and for the pure storage power stations to be built in the near future, it appears that a flood peak of 150 to 250 meters and a single generator capacity of 100,000 kilowatts are more suitable.

In general, when our nation's electric power networks build storage power stations in the future, regardless of the locality, type, scale, etc, everything must be based on the objective conditions of the locality, and the best time and the best type must be selected after seeking truth from facts through technical and economic comparisons. We must follow the principle of doing things according to natural patterns and economic patterns.

V. Have We Found a Superior Site for a Storage Power Station in the Eastern China Region? Can the Electric Power System Assure Power for Pumping?

Since 1973, the Eastern China Electric Power Administration Bureau has organized concerned units to survey southern Jiangsu, southeastern Anhui, northern Zhejiang in the area of the load centers and the ultrahigh voltage lines in the regions north and south of the Huai River, and Xuzhou up to northern Zhejiang and southern Jiangsu, and has found nine possible sites for power stations. At present, the Eastern China Survey and Design Institute of the Ministry of Electric Power Industry is doing further work to examine the building conditions at each site in order to select the best plant site.

The daily load graph of the electric power system shows natural peaks and troughs. In industrially developed nations, the late night low trough loads frequently reach only 50 to 60 percent of the peak load, and so there is a definite surplus capacity which can be supplied to storage power stations for pumping. During the 10 years of chaos in our nation, electric power construction lagged behind the need for power, there was a shortage in the supply of fuel for thermal power plants, hydroelectric power stations were out of control, and the supply of electricity by each electric power network was in short supply. Taking the Eastern China electric power network as an example: around 1975, it was deficient in power and in capacity, and measures to use electric power by shifts had to be carried out. At high peaks, frequently limitations had to be imposed on the use of power. But beginning in 1979, when the policy of readjustment of the national economy was implemented and carried out, each factory implemented cost accounting and became responsible for its own profit and loss, the conflicts in the supply and the use of electric power within the network gradually improved, the daily load factor gradually dropped to 87 percent, and the lowest load factor dropped to 73 percent. The quality of the cycles and voltage all met the standards. In the future, the proportion of consumption of electric power by the light and textile industries and by the people for daily living in the Eastern China region will further improve, the proportion of electric power consumption by the industries that consume large amounts of power will drop relatively, and therefore the daily load factor will continue to drop; it is estimated that after 10 years, if the highest load within the network reaches 16 million kilowatts, the peak and trough difference will be over 5 million kilowatts. For the safety, versatility and economic operation of the network, the optimum combination of various types of peak regulating power stations should be used. Besides the hydroelectric and thermal power stations (plants) that are operating, being built or being planned, it is necessary to consider plans for pumped storage power stations. An installed capacity of several hundred thousand to a million kilowatts will serve to cut the peaks and fill the troughs. Such a large difference between the peaks and the troughs in the entire network should provide sufficient surplus capacity for electric power for pumping. Sites for storage power stations at Fushan in Panchang and Fahaiwu in Suzhou have superior building conditions and technical and economic indicators and they are worth further study. In view of the above situation, we suggest that a pumped storage power station of over 200,000 kilowatts be built first in the eastern region. Instead of workers working at night, it can use the electricity at night to pump water so as to generate electricity the next day during daytime. Its entire building cost, including compensation for extra wages for overtime, can be retrieved within 2 years after operation begins. By using it, several hundred thousand workers who use electricity on shifts will be able to return to daytime labor, wealth will be created for the power network, and experience will be gained in the building of large pumped storage power stations in our nation.

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CSO: 4006/391

HYDROLOGICAL SURVEY WORK ESSENTIAL IN HYDROPOWER CONSTRUCTION

Beijing SHUILI FADIAN [WATER POWER] in Chinese No 3, 12 Mar 81 pp 3-6

[Article by the Planning Department of the Hydroelectric Power Construction Bureau: "Several Opinions Concerning Hydrological Survey Work in Strengthening Hydroelectric Power Construction"]

[Text] I. Major Achievements

Hydrological survey work is an important part of the early stage of hydroelectric power construction. Since the founding of the nation, hydrological survey work has realized great achievements and has contributed its share in the construction of hydroelectric power. This is mainly manifested in the following:

1. A technical team has been trained in hydrological surveying, and a group of specialized hydrological survey stations directly serving hydroelectric power construction has been established. At the beginning of the 1950's, hydrological survey work for hydroelectric power was basically a blank. According to statistics of the hydrological departments, at the time of liberation, basically the nation had only 353 hydrological survey stations, and information was extremely deficient. There were no hydrological stations along the rivers where hydroelectric power stations were being planned, such as the Yili River, Liulangdong, or the Lushui River in Yunnan. The work to determine the hydrological and meteorological characteristics of the power station localities and to provide the necessary hydrological data for the design of the power stations was very difficult. We conducted training classes and trained a group of young people, and through work and practice, they quickly became a technical and hydrological survey team which could carry out hydrological tests, hydrological surveys and organize hydrological data. By 1958, the number of hydrological survey personnel directly serving hydroelectric construction grew to 1,400 persons; 400 specialized hydrological survey stations of various types were established (after 1958, some of the hydrological survey stations were placed under local jurisdictions); and various types of observational, surveying and investigative work were launched, filling the deficiency in observational data and basic stations of the nation, and the necessary hydrological and meteorological information was gathered for our nation's hydroelectric power construction.

2. Testing facilities were renovated, testing methods were improved, testing accuracy was improved, and a reliable reference was provided for the rational

determination of engineering and hydrological calculations. During the 1950's, equipment used to test the flow of water was relatively simple: generally the surveying boat was anchored and a tachometer was used to measure the rate of medium and low speed flow. Measurement of high speed water flow was mainly dependent upon a buoy. The precision of the information was low. In the 1960's, most of the survey stations used cables of floating cranes pulled across the river to measure the speed of flow; individual stations also set up electrically powered cables and improved the capability of measuring the flow by the tachometer. During recent years, hydrological cables have become the major flow measuring equipment of our nation's hydrological survey stations; the scale of flow measurement using the tachometer has grown greatly, and favorable conditions have been created for improving the quality of testing. Of the presently existing 14 specialized hydrological survey stations of the hydroelectric power system, 9 have set up electrically powered flow measuring cables. In July 1976, the Naigesha special hydrological station built for the Lubuge Power Station Design Institute at the Huangni River in Yunnan, using the cable tachometer, measured the greatest peak flow of flood water since the founding of the station in 1958, and the water level-flow relationship curve was rationally revised accordingly. The designed peak flood flow for each 10,000 years was revised from 12,700 cubic meters/second to 9,350 cubic meters/second; therefore the scale of the original design of the flood relief structure of the power station was changed, allowing the saving of capital for the state.

3. In combination with the design needs of hydroelectric power stations, greater achievements have been realized in specialized surveying and experimental research. For example:

A. The observations and surveys of ice conditions, investigations of ice conditions, and forecasting and research on the formation of rivers carried out for the reservoir region of the Second Baishan Power Station of Songhuajiang and its upper reaches served well to solve the problems of draining ice and guiding the flow during the construction period of the Baishan Power Station. The data obtained from the observation and research of the ice conditions of the Yellow River and its upper and lower reaches for the reservoirs of the power stations at Liujiaxia, Yanguoxia and Qingtongxia also provided precious measured data and practical experience in analyzing the conditions of the formation of ice jams and ice dams and in the method of calculating ice jams.

B. In the analysis and calculation of floods in the design of the Ankang Power Station on the Han River, observation and study of the specific drop of flood water on the section over 10 kilometers downstream from the power station revealed that the downstream valley acts to control and confine the water of the measured flow section during high water level periods; the specific drop of the water surface slows down as the amount of flow increases. From this pattern, the originally established water level-flow relationship curve was revised, and based on this, we calculated that the peak flow of each historical flood was less by 7.3 to 13.3 percent. This rationally readjusted the design of the peak flow of floods so that the standards for construction to handle floods were improved without changing the designed peak flow of floods.

C. Experimental research on reservoirs carried out on the Yanguoxia, Qingtondxia and Liujiaxia reservoirs along the Yellow River showed in time the changes in alluviation of incoming water and incoming sand in front of the dam and in the reservoir and provided a scientific basis for proposals on the rational utilization of the reservoir. For example, observation of the abnormal density currents of the tributary Tao River flowing into the Liujiaxia Reservoir (the average amount of sand over many years flowing into the Liujiaxia Reservoir constitutes 30.6 percent of the total amount of sand entering the reservoir) enabled us to grasp the opportunity and the appropriate time to open a drain in order to extract the sand and to improve control of the rise of the alluvial surface in front of the dam and the amount of sand passing through the generator. Experience in the operation of the Qingtongxia Reservoir and the results of extracting sand were summarized by analyzing the data on tests of the mud and sand.

D. During the latter part of the 1950's, testing and research on shoved and shifting mud and sand were carried out in the Xinan River and the Min River. At present, testing and research of large shoved and shifting pebbles are continuing at the Jiangshe Dam and in the Baisha River on the upper reaches of the Min River. Preliminary achievements have been realized in the method of testing and in the efficiency of experiments to develop sampling machinery and sand extraction.

E. Observations of water surface evaporation were carried out at the special hydrological stations on the Xinan River, the Fengman Reservoir, Shangquan on the Yellow River, the Shangyou in Jiangxi, the Mapei in Shangzhi in Hunan, and Fuxian Lake in Yunnan. However, because most of the test stations were reassigned to local authorities, the gathering of data stopped. In 1975, using Yangzuoyong Lake in Xizang for the study of hydroelectric power generation in natural lakes, because of a lack of sufficient information on water surface evaporation on plateaus, an evaporation observation field was established in the empty land next to the lake; an evaporation pool of 20 square meters was built and different types of evaporation bowls were used for comparison and observation. The Xiaodeshi special hydrological station on the Yalong River established for the Ertan Power Station also set up large evaporation pools to carry out observation and research in evaporation.

In addition, when building hydroelectric power stations in karst regions where hydrogeological conditions are complex, leakage of the reservoir is also a key problem. In analyzing the pattern of leakage of a reservoir and judging the development of leakage, hydrological surveying and research are also important means. For example, it was discovered that the Shuicaozi Reservoir in Yunnan leaked after it began storing water, and through analysis of hydrological and observed data, we found the scope of the leakage and were able to understand the pattern of leakage and to provide a scientific basis for correctly establishing procedures to handle the situation.

II. The Main Tasks at Present

In 30 years, our nation's hydrological work has undergone great change. The basic network of hydrological stations of the nation has developed greatly (as of the end of 1978, the nation had 17,584 hydrological test stations of various types), testing equipment has been improved, the precision of the various types of observed and test data has been improved to varying degrees, basic hydrological information can be provided for hydroelectric power construction, and compared to the 1950's the situation has visibly improved. In the new situation at present, to adapt to the needs of the development of hydroelectric power construction, we believe the following three aspects should be grasped well.

1. Distribution of special hydrological testing stations. At present, the development of the nation's basic network of hydrological stations is not evenly spread throughout the nation. The density of the network of stations in the southwest and the northwest is still sparse, and the water energy resources in these regions are extremely rich, especially in the southwest, where the reserve of water energy resources constitutes over 70 percent of the nation's reserve of water energy resources. The presently existing basic hydrological stations cannot satisfy the demands for hydroelectric power plans and designs in these regions. For example, the mainstream of the Lanchang River valley, which is about to be developed, extends for 2,000 kilometers in our nation, but at present there are only five basic hydrological stations there. Therefore, while actively seeking the cooperation of hydrological departments to hasten and increase the establishment of basic stations, the present planning and design needs must be taken into account in planning for the development of hydroelectric power construction, and a group of special hydrological stations must be established on the present foundation of the network of basic hydrological stations. In other regions, where certain hydrological aspects of the rivers are more complex, the presently existing network of basic stations cannot control the characteristics of water and sand, and so when the present network cannot meet the demands of hydroelectric power construction design, special hydrological stations must also be added.

2. Observation of the water level at plants and dams. Except for the damsites where hydrological stations have already been built, generally water level observation stations need to be established at plant sites and damsites to gather information on the water level and the flow on the upper and lower reaches of the dam in order to draw a water level-flow relationship curve for the plants and dams. The number of water gauges to be established depends mainly on the situation of the rivers in the dam area and the concrete demands of engineering design.

3. Specialized hydrological surveys and experimental research. Because a lot of the information needed in the design of power stations cannot be observed and measured by ordinary basic hydrological stations, specialized survey and research work must be organized. For example: 1) To fully grasp the characteristics of the testing station, observation and testing of the patterns of variation in the specific drop of the surface of flood waters within a relatively long section downstream from the section of the testing station must be carried out. 2) Comparative tests of the buoy coefficients and the flow velocity coefficients of the water surface must be conducted. 3) Ice conditions in the river channels and reservoirs of frozen rivers must be observed and studied. 4) To study flood water entering reservoirs, hydrological observation and testing of the evolution of flood waters in the reservoir area and the unstable flow in river channels must be carried out. 5) Observation and experimental research in hydrology and mud and sand of reservoirs must be carried out. 6) Observation and study of

evaporation of water surfaces must be conducted. 7) Hydrological observation and research in special regions such as hydrological surveys of karst regions and observation of leakage of reservoirs must be conducted.

Under ordinary conditions, when carrying out the planning of river valleys (river sections), after fully studying the various aspects of technology and economics and after selecting the river section for the first-phase construction, we must immediately consider carrying out and strengthening testing work which serves as a reference for various methods of engineering and hydrological calculations for the test stations (basic station or special station) and we must establish the observation of water levels at plants and dams. When there are too few basic hydrological stations, when the hydrological situation is complex, or when the presently existing stations cannot control the characteristics of the water and sand of the rivers, proposals should be submitted to the hydrological departments to establish more basic stations as soon as possible, and when necessary, consideration should be given to the establishment of special hydrological stations. During the preliminary design stage, besides continuing to carry out the various observations and tests during the planning stage, the necessary ground surface meteorological observations must also be carried out to supplement the information needed regarding the climatic characteristics of the dam area. Consideration must be given to the planning of a network of water (rain) forecasting stations to carry out flood forecasting during the construction period. According to the actual situation, when necessary, consideration must also be given to drawing up plans for experimental research work for the reservoir after the reservoir has been built. Also, special surveys and observation and research work related to the items described above must be carried out. The content of the work and the estimated funds required to carry out these observations and tests as well as the personnel needed must be correspondingly included in the documents to be submitted together to the higher authorities for review.

Because hydrological survey work is more important during the beginning period of hydroelectric power construction than other aspects of work, the tasks must be considered, planned and carried out early.

III. Several Suggestions

The present situation of hydrological survey work for the hydroelectric power system and the demands of the development of hydroelectric power construction are very much out of step. Leadership must be strengthened urgently and measures must be taken to change the situation.

The technical force presently available is only one-fourth that available in 1958, the average age of the technical personnel is older in general, and the scientific and cultural level is lower. According to incomplete information and statistics of the several design institutes, the average age of the workers in hydrological surveying is over 45 years, and many are unsuited for continued field survey work. The technical cadres of the hydrological survey teams constitute about 30 percent, and among them, those with a cultural level of university and college education constitute only about 10 percent. The number of various types of special hydrological test stations is nine-tenths less than the number existing in 1958 (some were placed under the jurisdiction of the local hydrological departments), the testing equipment is outdated and backward, and the equipment has not been renovated for many years. Therefore, to enable hydrological surveying work to adapt to the trends of modernized construction, and fully satisfy the demands upon hydrological work in the various stages of design, construction and coperation, we suggest the following:

1. We must emphasize hydrological survey work. Many years of practice prove that where the hydrological survey work has begun early and the work has been done fully, the results of hydrological analysis used as the basis for planning and design of construction along the river have been more rational. Conversely, where the work has been passive, it has even affected construction. Each level of leadership should give sufficient emphasis to hydrological survey work, strengthen the leadership, and insist on correcting the mistaken view that hydrological survey work is not important or even that hydrological analysis can be carried out without hydrological survey work. Without carrying out a definite amount of geological survey work, it is not possible to propose a reliable geological conclusion; without complete hydrological survey data, similarly it is not possible to provide reliable hydrological data. At present, the significance of hydrological survey work in hydroelectric power construction has not been fully recognized, so the work cannot be done, the difficulties of the work cannot be easily solved. This situation should be quickly turned around, each level of leadership must grasp hydrological survey work as tightly as it has grasped geological survey work to establish a firm and reliable foundation for hydroelectric power construction.

2. We must build up the teams. During the beginning period of the 1950's, because we built up the survey teams, work progressed rapidly. Now, our forces have been weakened, the organization and the agencies are not sound, some design institutes even today do not have agencies and personnel in charge of hydrological survey work, and the work cannot be carried out. In the face of this situation, each design institute must rapidly establish hydrological survey teams and further reorganize and make sound the already existing special agencies. New agencies should be quickly strengthened. Institutes that have not yet established specialized agencies must rapidly assign personnel to establish an organization and quickly begin work. During the course of establishing work teams, we must first undertake the technical training of cadres and workers, such as conducting operations training classes and training and learning sessions during the dry period. Where conditions permit, personnel can be sent to related schools for training, and through various means we must improve the scientific, cultural, technical and operational levels of the workers. Second, we must strengthen the work of political ideology, revive the spirit of hard struggle existing during the 1950's, revive the good traditions and workstyle resolutely, and in particular, we must strengthen the education of young workers so that they can learn conscientiously and work without worries. We must care about the workers, especially workers who work long periods in the field stations; we must care about their learning and their lives and concretely solve their actual difficulties, fully mobilize the enthusiasm of the broad masses of workers, and build up hydrological survey teams that are well trained, versatile, and suited to the characteristics of hydrological surveying work for hydroelectric power construction.

3. We must strengthen management of the test stations. To assure the quality of the research results and the test data, we must establish a sound system of regulations. During the period of interference by the extreme leftist line, many effective regulations were abolished, creating chaos in production. In the present new situation, efforts must be made to study the needs of the work and to supplement and establish new working systems and technical regulations; for example, the duties of the technical positions of each level, how to implement the "four simultaneous tasks" in testing work (simultaneous testing, calculating, organizing, analyzing) to assure precision of the test data, organization and review of data, technical safety and operation of the test stations, and use and maintenance of instruments and equipment should all be subjected to practical regulations and included in working systems, and during the course of implementation we should continuously summarize the experience and gradually perfect the operation. At the appropriate time, we must study the actual situation of hydroelectric and hydrological survey work and establish and supplement technical regulations on the foundation of the "hydrological testing trial standards" of the hydrological departments.

4. We must improve the methods, means and quality of testing. In recent years, there has been a definite improvement in the equipment and method of testing. But many problems still exist. For example, continuous research and improvement are required in measurement of the flow at high water levels, extraction of sand by cable, and testing of shoved and shifting materials. In particular, we should study the use of electrical measurements, automatic recording, long-distance communications and computers and similar new techniques in testing methods and organization of data, keeping in view the characteristics of the work of hydrological testing stations specifically for electric power generation so as to assure the quality of the data and the safety of the testing work, and testing equipment should be developed that is light weight and convenient, easy to transport and easy to assemble. On the basis of our actual situation, we should learn the advanced experience in hydrological survey work at home and abroad, appropriately introduce new types of instruments and equipment from abroad, and improve the standard of testing techniques.

5. In accordance with the task of planning and design for hydroelectric power, we should establish plans for hydrological survey work for the next 2 to 3 years. Combining the planning and design tasks of one's own unit, we should study and draw up working plans for the next 2 to 3 years to serve as the basis for launching the work. The plans should include the distribution and reorganization of specialized hydrological testing stations, specialized hydrological surveys and experimental research, reform of the testing equipment, and how to implement organizational measures and technical measures. As to the distribution of specialized hydrological stations, we should first consider establishing them along rivers in border regions where the water energy is rich and where the network of the state's basic stations is sparse. This is a strategic work. In the early days of the founding of the nation we paid attention and took more initiative in the work; now we must strengthen that work. The establishment of specialized hydrological testing stations must be different from the state's basic hydrological stations: the distribution must be decided on at an early stage, the construction must be quick, and after the plans have been completed, they can be transferred. To assure that the plans are carried

out smoothly, in drawing up the plans we must closely match the requirements of the plans and the design, and we must fully carry out surveys and research to insure that they are practical.

6. The responsible departments must start out by doing a good job of building the early stage foundation work for hydroelectric power; the necessary material foundations must be provided to solve well the problems of funding, equipment and personnel for hydrological surveying and experimental research, which must be carried out early to assure the smooth progress of the work.

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CSO: 4006/391

ENERGY

SERIOUS LONG RANGE BIOGAS PRODUCTION EFFORTS REPORTED

Wuhan HUBEI RIBAO in Chinese 12 Jul 81 p 1

[Article: "Hubei Province's Biogas Construction Begins To Take Root Among the Masses; Seeking After Truth in Facts and Proceeding From Reality in Everything"]

[Text] The program of seeking truth in facts and proceeding from reality in doing everything, advocated by the CCP Central Committee, has sparked biogas construction in Hubei Province.

Statistics from relevant departments show that in the 3 year period since 1978, 134,000 new biogas pits have been constructed in Hubei, 2½ times the number built in the 12 year period from 1958 to 1977. Half the newly built biogas pits were built last year when there was an agricultural disaster and funds were comparatively scarce. This situation demonstrates that during the past several years, biogas construction in Hubei Province has developed fairly rapidly, that biogas construction has begun to take root among the masses, and that its reputation is going higher and higher.

Hubei Province's rural villages have a severe shortage of firewood. As early as 1958, in a search for new rural energy sources, some places began to pool funds to make biogas. Subsequently, because of a tendency toward overanxiousness to get results and oversimplified and rapid planning in the guiding mentality, many places proposed unrealistically high standards, onesidedly emphasized conservation or substitution, did not seek quality, and did not put emphasis on benefits. As a result, after several flipflops, and various ups and downs, by 1977, more than 30,000 of the 52,000 biogas pits constructed had become ailing or abandoned pits. The masses attributed these ailing and abandoned pits as gripe pits saying, "A waste of work and use of money for nothing; it would have been better to have lost it doing something else."

Since the 3rd Plenary Session of the 11th Party Central Committee, a policy of proceeding from realities has been followed in biogas construction. First of all, on the basis of economic conditions in individual places, the extent of firewood shortage, the labor foundation and technical strength available for making biogas, biogas construction has been divided into four different kinds of counties. Some are required to spread biogas throughout the county; some are to extend their use of it; some are to have more demonstration areas; and some are to operate only test sites. In this way, the biogas construction battlefront is shortened, leadership relatively strengthened, and limited material resources and funds put to better use. Second is the abandonment of the former lopsided seeking after quantity and replacing it with emphasis on quality in the building of pits, and measures being adopted, at the same time, to assure quality in construction. Methods include spread of a system of contracts for pit construction, formulation of training tests, and acquisition of certificates of proficiency by biogas technicians before undertaking construction. Some counties have also set up special biogas service companies.

There is a concern for benefits and steady development so that biogas can establish a new reputation among the masses, and develop faster rather than slower. In 1980, the province used about the same amount of funds and cement as in 1979 for biogas construction, but 75 percent more pits were constructed than in 1979, and the pit success rate was better than 97 percent. Luoji Commune in Zhongxiang County is a place with a serious firewood shortage where, as a result of steady development, 58 percent of all peasant households in the commune have built biogas pits. In the course of a year, the commune has conserved 8.97 million jin of vegetation used for firewood; commune members have increased manure collections by 280,000 man-days; and production teams have saved 84,000 yuan that would otherwise have been spent for fertilizer. Shuangyan Production Brigade, Yaqueling Commune in Yichang County, which could not assure proper quality construction watched others for 2 years and waited for 3. After taking action to assure pit construction quality, the masses realized benefits, and this production team has developed biogas everywhere in only a year.

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CSO: 4006/432

ZHEJIANG OFFICIAL OUTLINES REQUIREMENTS FOR INDUSTRIAL GROWTH

Hangzhou ZHEJIANG RIBAO in Chinese 26 Jun 81 p 1

[Article: "Expansion of Sources of Raw Materials and Conservation of Energy To Maintain Hubei Province's Steady Industrial Growth Pointed Out by Li Fengping [2621 6265 1627] in Analysis of Industrial Production Situation at Provincial Industrial Exchange Conference"]

[Text] How can Zhejiang's industry grow steadily and continuously? On 24 June, the final day of the provincial Industrial Exchange Work Conference, Li Fengping, the provincial governor, spoke in detail about Zhejiang Province's industrial production situation, giving emphasis to analysis of the underpinings and weak links in Zhejiang Province's industry. He emphatically pointed out that the key to maintenance of steady and continuous growth of industry lies in a fundamental policy in which self-reliance is dominant and getting outside support is ancillary.

Comrade Li Fengping said that since the smashing of the "gang of four," and particularly since the Third Plenary Session, Zhejiang's industrial production has developed very rapidly. Last year total industrial output value for the province was two and one-half times that of the period before the smashing of the "gang of four." Between January and May of this year, output value had increased 13.5 percent over the same period last year. These accomplishments were the result of the CCP Central Committee's correct leadership since the Third Plenary Session, and the result of the implementation by people throughout the province, particularly by the broad masses of cadres and workers on the front line of industry and transportation, of the "Eight Character Policy." However, the difficulties Zhejiang industry faces in continuing steady growth are considerable. Energy is in seriously short supply; there are many shortages in raw materials; capital is scarce and problems in foreign trade exports are numerous. Therefore, our leadership comrades on all echelons must maintain clear heads and not develop feelings of arrogance and conceit as a result of the rapid growth of industry during the past several years, nor should they develop apathetic and pessimistic feelings because of the fairly numerous hardships to be faced. If leadership comrades on all levels will diligently carry out a fundamental policy in which self-reliance is dominant and gaining outside assistance is ancillary, will rely on the broad masses, and actively do a good job, these hardships can be surmounted, and the industry of Zhejiang can continue steady and protracted growth.

More than 70 percent of the raw materials for Zhejiang's light textile industry derive from agriculture. A dependable road to self-reliant solution of the problems of raw materials for the light textile industry is planned building in rural villages of various kinds of raw materials bases. Raw materials bases may be built for cotton, hemp, silkworm cocoons, sugarcane, sheep wool, rabbit fur, lumbur, mao bamboo, aquatic products, leather, various minerals, fruits, vegetables, etc. In short, the farming industry and the hatching industry of rural villages can be built into bases for industrial raw materials. Some of these industrial raw materials may be given to industrial units for processing, and some can be rough processed by communes and brigades, the semifinished products given to industrial units for fine processing. The building of raw materials bases should be combined with the development of diversification in rural villages, and should be led by planning departments, with the participation of industrial, agricultural, forestry, commercial, supply and marketing, and foreign trade departments in making a raw materials production plan. Next industry, foreign trade, and supply and marketing departments should form direct links with rural communes and brigades to establish raw materials bases. The building of raw materials bases will not necessarily require the use of grainfields. Zhejiang Province has spacious mountain areas, sea beaches, hills, and river flats, which should be fully developed and used, adapting general methods to local situations for the building of various kinds of raw materials bases. In the building of raw materials bases, there has to be an adherence to the principle of equality and mutual benefit. Industrial plants and rural communes and production brigades must be linked together and sign economic contracts, which are examined and authenticated by industrial and commercial administration and management departments, each bearing economic and legal responsibilities. In order to do a good job in the building of raw materials bases, the three echelons of province, prefecture, and county should establish raw materials base funds, allotting money from reserve financial resources to make non-interest bearing loans. Subject to concurrence of fiscal departments, industrial departments and industrial enterprises should allocate some funds for construction of raw materials bases.

The shortage of energy is not a short-term matter, but a long-term one the solution to which lies in conservation. Right now, energy is short, while at the same time energy waste is a common phenomenon. This is very serious in some places and departments. Therefore, it is necessary to implement the pertinent instruction of the CCP Central Committee and of the State Council to devote serious attention to conservation work. There are three ways of doing this. One is inciting the masses so that every individual saves. The second is adoption of economic measures and administrative measures. The third is improvements in wide-ranging economic cooperation. Any ideas which a person thinks he can carry out himself without seeking the help of others are unworkable. In Zhejiang Province, in particular, where processing industries are numerous, and the proportion of market adjustments great, economic cooperation is all the more necessary. In our economic cooperation, we must keep our eye on cooperation to have a flow into the province of raw materials that are in short supply here, in order to enliven production. It is necessary, first of all, to do a good job among prefectures within the province and among departments. Everything must be done in accordance with the principle of equality and mutual interest, mutual exchange between haves and have nots, and use of strengths to make up for weaknesses. Some can supply raw materials; some can provide semimanufactured goods and odd components; others can supply technology and equipment. The forms of cooperation may be diversified, as for example joint industrial and trade, joint agricultural and commercial, joint agricultural and trade, etc. So long as it can promote production and can arouse the enthusiasm of all quarters, any form may be adopted. The focus of cooperation with other provinces lies in organizing the importation of fuel and raw materials, and bringing in of technology and equipment that Zhejiang Province lacks to launch domestic compensatory trade and to receive goods brought in for processing. For this purpose provincial and prefectural cooperation offices should be strengthened and broughtup to necessary strength. In addition, it is necessary to launch economic exchange activities outside the country, and actively get into processing of materials brought in from foreign traders, bring in specimens for use in writing orders, bring in parts for assembly, and engage in compensatory trade and joint capital ventures. The prevailing management system is overly centralized, has numerous links, and a proliferation of procedures. This should be gradually changed. Different projects should be permitted a relaxation of jurisdiction for examination and approval, and a simplification of procedures to enliven the economy.

At the conference, Comrade Li Fengping also said that for Zhejiang's industry to continue stable and protracted development, it was also necessary to intensify administration and management work. He said we should study advanced domestic and foreign administration and management experiences, and train large numbers of administrators and managers in order to elevate the administration and management of Zhejiang's industry, commerce, and foreign trade. There should be a planned dispatch of sales personnel and technicians to rural villages, to other provinces, and even to foreign countries to understand market changes and the needs of consumers, to promote sale of products, and to purchase raw materials. Every means should be used to spread information over a wide area about name brand goods, traditional goods, and high quality goods, using newspapers, broadcasts, television, advertising, trademarks, samples, and explanation booklets. Information should be disseminated not only inside China, but also in the Hong Kong-Macao market and in foreign countries. Once sales work has been enlivened, Zhejiang's industrial output will enjoy wide markets.

Finally, Comrade Li Fengping spoke on the issue of combining scientific research and production. He said that without this provision, continued, stable, and protracted development of Zhejiang's industry would not be possible. The development of both the domestic and foreign economies has more and more demonstrated the importance of science and technology. In maintaining quality and quantity of existing industrial manufactured goods, in developing and increasing output of new goods, and in making technological improvements in enterprises alike, if one departs from science and technology that is like a "blind man riding a blind horse"; it simply will not work. Conditions in Zhejiang are very good in this regard. There is Zhejiang University, Hangzhou University, agricultural universities, medical schools, and the Zhejiang Academy of Engineering. There is also a group of researfch organizations in the Provincial Academy of Agricultural Sciences, and numerous scientists and technicians in industrial and mining enterprises. Zhejiang Province has made achievements in scientific research in the past, and progress has been made in the spread of research results. However, some industrial departments and industrial enterprises give insufficient attention to research, and they do not pursue vigorously the application of research results. Some industrial departments even refuse to use research results. Such attitudes are extremely wrong. Leadership comrades at all echelons must increase their understanding, make full use of the role of scientists and technicians of all kinds, and actively spread the results of research to promote development of production.

Comrade Di Xiwu [5049 5047 2976], the deputy governor, also spoke at the conference.

The Provincial Industrial and Transportation Work Conference began on 6 June and lasted a total of 9 days. Delegates to the conference included leadership comrades responsible for industry in all prefectures, municipalities, and counties, responsible personnel in economic committees and financial offices, and comrades in charge of relevant departments at the provincial level and in provincially operated plants and mines, totaling more than 300 people.

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CSO: 4006/432

ECONOMIC PLANNING

ECONOMIC REFORM IN SICHUAN PROVIDES VALUABLE EXPERIENCE

Hong Kong CHING-CHI TAO-PAO (ECONOMIC REPORTER) in Chinese No 23, Jun 81 pp 4-7

[Article by Lin Ling [2651 0407]: "Reform of China's Economic Organization Tested in Sichuan"]

[Text] An experiment in reform of the economic organization was begun in China's Sichuan Province in the fourth quarter of 1978. The reform was conducted in accordance with the guiding principles determined by the Third Plenary Session of the 11th Chinese Communist Party Central Committee. The objective of the experiment was to test, without creating a great disturbance, whether the present economic system, with its principal characteristic being highly centralized administration and management, could be transformed to suit the characteristics of China's socialist economy--an economy that would fully develop the regulatory function of the market under the guidance of state planning--to suit the needs of developing productive force and accelerate the advance of the four modernizations.

The biggest drawbacks to our country's economic management system are, for one thing, that authority is too centralized, and for another, in eating from the common pot, enterprises become an accessory to the administrative organ, depending on the superiors to come and move the "abacus beads," and fettering the initiative and activism of the enterprise and the workers. This creates economic rigidity and loss of mobility. Our country has carried out many reforms of the economic system since the founding of the nation, but these involved mainly the delimiting of boundaries between central and local authorities, and documents as to whether the central or the local authority was to control the enterprises. These [reforms] concentrated only on motivating the activism of the center and the locals, and paid no attention to mobilizing that which directly bears a burden of building the socialist economy--the activism of the enterprises and the workers--and so the result was that no matter how much they were reformed, the [reforms] never touched any vital parts of the system and were extremely unsuccessful.

After the smashing of the "gang of four," a movement to liberate thinking was begun in our country, encouraging us to reexamine socialist economic theory in the light of almost 30 years of our practice. Through conscientious discussion, we gradually realized that our socialist economy, besides being a planned economy, is also a commodity economy. Enterprises under the system of ownership by all the people are opposite independent commodity producers. Our country's economy cannot be brought to life until the management system is reformed in accordance with the principles of commodity economics, the principles of socialized large producers, and the principles of socialism, motivating the activism and initiative of the enterprises and the workers. Starting from this realization, Sichuan chose the path of trial reform of the system by taking as a point of departure the expansion of the authority of enterprises to decide for themselves.

The experiment in expanding the authority of enterprises to make their own decisions was conducted initially in six industrial enterprises; in 1979 it was extended to 100 industrial enterprises and 40 commercial enterprises. As of the present, 417 industrial enterprises, 250 commercial enterprises, and a few transport and construction enterprises have been selected as the test base. In this way we will be able to promote reform of the management system in planning, materials, commerce, finance, banking, capital construction, and other fields to a relatively large degree.

The point of departure for expanding the authority of enterprises to make their own decisions is: liberate the enterprise from the fetters of the existing system and make it truly become a socialist commercial producer. To achieve this, we require a developmental process. This process more or less includes: implementing retention of a portion of the profits, appropriate expansion of the enterprise plan arrangements, marketing of products, and expansion of authority in re-production and such areas; implementation of "independent accounting, figuring taxes as profits, and assuming sole responsibility for profits and losses" (here we should explain that with enterprises under the system of ownership by all the people, because the means of production are owned by all the people, most of the enterprise's profits must be turned over to the state; when the enterprise suffers a loss, the state must still guarantee basic living expenses to the employees; therefore, this sole responsibility for profits and losses has a certain relativity); liberate the enterprise from its subordinate relationship to department and districts; and make the enterprise truly able to carry on production management activities independently under the guidance of the national plan. At present a great many enterprises in Sichuan are practicing retention of a portion of the profits, and five enterprises are trying to practice sole responsibility for profits and losses.

There are a great many problems associated with the beginning of expansion of the authority of enterprises to make their own decisions, and the principal of these are in five areas: Should enterprises be given definite planning authority, or should they be allowed to organize production according to the requirements of the market under the national plan? Should enterprises be given specific product marketing authority, or should they be permitted to sell part of the product, including the means of production, on their own in the market? Should enterprises be given specific economic benefits, or should they be permitted to retain part of the profits, depending upon whether management has been good or bad, to serve as enterprise capital? Should enterprises be given the authority for a specific expansion of re-production, or should they be permitted to raise their own capital for development of potential, renew, rebuild, and expand reproduction according to the value of their fund?

Should enterprises be given specific personnel authority, or should enterprises be permitted to carry out their own recruiting of workers and promoting of cadres? The posing of these problems of course touches on the various aspects of the present system and on the traditional theoretical concepts that are reflected in the present system. This will provide a kind of bottom-to-top motivation for the reform of the economic system, and it will provide an objective basis for carrying out the reforms correctly.

After 2 years of experimentation, it is no longer possible to assume that a socialist enterprise can carry out production only according to targets that are like instructions from the state, because an enterprise can set up its own supplementary plans outside the state plan, according to the needs of the market, and can make its own adjustments where the state plan does not suit the need of the market. This without doubt represents a great reform in the planning system. The fetters are of the theory that the means of production are not commodities have already been broken, and except for a few products that have to do with the national economy and the people's livelihood, dangerous goods like explosives, and products that are in short supply, which are still subject to unified purchase and allocation, most means of production go into circulation, and an enterprise can satisfy its requirements either through direct supply contracts or through free purchases in the market. The system of unified purchase and exclusive selling rights has been replaced by several forms of buying and selling, such as unified purchase, pick and buy, negotiated purchase, self-marketing, etc. Enterprises can market a portion of their product themselves, and large shops can lay in stock directly from the factory, without going through the wholesale stage. The core of the reform is the acknowledgement that enterprises under the system of ownership by all the people occupy a primary position as far as the national welfare is concerned, and that they should have their own relatively independent economic interests. This is something that could not be discussed or thought of in the past. Now an enterprise can enjoy a certain profit proportionate to whether the management has been good or bad and can use it to develop potential, renew, rebuild, and otherwise expand re-production as directly related to simple re-production, or to provide increased bonuses to the employees or improve their collective welfare. The principal investment is still controlled by the state, however, and enterprise investment must be appropriate to the guidance of the state plan, bank funds must be subject to control, and norms have been set for any increase in wage funds. The only thing that has not been reformed to any extent is the labor system. Because our country must keep as many people employed as possible, we are not able to select and recruit only the best.

These reforms have caused what has always been considered a resource alien to the socialist economic system--market regulation--to enter into our economic lives and begin to become a powerful force invigorating our economy.

Traditional theory assumes that under conditions of socialism, the law of value has no regulatory function in the sphere of production. After an enterprise formulates supplemental plans according to the requirements of the marketplace and then carries out production accordingly, supply and demand changes in the market begin to regulate the direction of employment of the enterprise's capital, and to transform the enterprise from one working only to complete its duties to one working for the needs of the market. As far as the enterprise is concerned, this is a fundamental change, greatly transforming the situation in which production was divorced from requirements. It shows that the production sphere cannot be separated from market regulation.

Traditional theory assumes that the law of value has a regulatory effect in the sphere of circulation but limits it to the circulation of consumer goods, excluding from it the means of production and thus creating a serious disjointing of supply and demand. This is the same as winding oneself up in a cocoon. The reform has put large amounts of the means of production similarly under the effects of the market mechanism and has brought about a marked improvement in the situation of supply and demand separation.

In the final analysis, market regulation is a question of price. Although we have not yet carried out a reform of the price system, the implementation of market regulation made it impossible that what is now in effect simply a planned price structure would not come into conflict with it. From the present view, this price structure has already begun to disintegrate, and four forms of prices have begun to appear: (1) Fixed prices--principally those means of production, livelihood materials, and a relatively large portion of commodities--still employ prices set by the state. (2) Floating prices--principally those means of production for which supply exceeds demand, such as electrical machinery products, etc.--float under prices set by the state. (3) Negotiated prices--principally a few commodities for which supply cannot match demand--have prices arrived at through negotiation between buyer and seller. (4) Free prices--which are the trading prices in rural markets, and which change with the changes in market supply and demand. This transformation of the price structure will readily allow some prices to rise, but in general its use has for some time begun to alter the situation of deviation between prices and values, opening the way for the full employment of price leverage to encourage the development of production.

The most striking effect of market regulation is that its influence on the economic benefit to the enterprise gets greater and greater, and the economic benefit to the enterprise has already begun to become linked with the competitive capability of its products in the market. When competitive ability is strong, economic benefits are large; when competitive ability is weak, economic benefits are small. In this way, competition, viewed by traditional concepts as a characteristic of capitalism, can appear quite unwittingly between enterprises engaged in the same trade. Market competition is like a formless but powerful propeller, moving the enterprise to produce, at all costs, products of good quality and low cost and of sorts that suit the market, to provide good service, and to obtain the greatest economic benefit, and constantly urging backward units to emulate those which are advanced. Sichuan is one of China's relatively backward districts as far as industrial development is concerned. The quality and variety of local industrial products are far from being the equal of those in the coastal areas. In the past they adopted a policy of protection, restricting products from the coastal areas from entering the Sichuan market, assuming that this would allow local Sichuan industries to develop. However, the result was just the opposite. Now competition has destroyed this protection policy, and large quantities of products from the coastal areas are pouring into Sichuan. People are concerned that local Sichuan industries will lose out in this competition. The facts tell us that competition on the one hand has presented a serious threat to local Sichuan industry, but at the same time it has provided a strong impetus that no administrative force could match: it has encouraged the enterprises to strengthen what they already had, to improve techniques, and to improve management. More and more of the products of local Sichuan industry are beginning to find their own places in competition throughout the country.

Competition has appeared among enterprises under the socialist system of ownership by all the people and has obtained a positive economic result, so it cannot make people wonder whether competition is after all a peculiar economic phenomenon of capitalism, or whether these conditions do exist in socialist production forms. Our country's economic academic circles have come to the conclusion, on the basis of an examination of the history of commodity production, that competition is not associated only with capitalism, but that it is associated with the production of commodities. Where there is commodity production there is competition. In the history of human society there have been small commodity producers, capitalist production of commodities, and socialist production of commodities, so there is competition under small commodity production conditions, capitalist commodity production conditions, and socialist commodity production conditions. Since our country's economy is a socialist, planned commodity economy, the appearance of competition cannot be avoided. However, competition under socialist conditions is not the same as competition under capitalist conditions. Capitalist competition is established on the foundation of the system of private ownership, and it represents competition of conflict between the fundamental interests of capitalists. Competition is like a merciless whip, constantly urging the advance of technology, while at the same time creating an anarchic situation for the development of production, the failure of enterprises, the loss of jobs by workers, and other results. Socialist competition, however, is established on the foundation of the system of public ownership, and it represents a competition of unanimity of the fundamental interests of socialist enterprises. We are completely capable of consciously mastering the laws and, under the direction and control of the plan, eliminating those negative aspects, and retaining and developing the positive. Therefore, socialism certainly does not exclude competition but instead should propagandize the "protecting of competition." This is just what our government is presently doing.

Competition between Sichuan enterprises is drawn from two specific factors. One is a market where supply exceed demand, and the second is that enterprises have independent economic benefits. The second factor is obvious. If an enterprise does not have independent economic benefits but eats from the big pot, it loses their internal motivation for competition. The problem lies in the first factor. In the economic life of our country, there is no question but that there has long been a situation whereby supply have been unable to meet demand, both in the means of production and in consumer goods; sellers of products have been in an advantageous position, while consumers (including consumers of the means of production) have had no alternative choice with regard to most products. "The daughter of the emperor need not worry about finding a husband," and so naturally there could not be any competition between production enterprises. Since last year our country has carried out a readjustment of the national economy, and a situation of supply exceeding demand has developed with regard to some commodities, giving consumers the possibility of a choice with regard to those commodities. The consumers' choice is merciless. This kind of choice is really an evaluation and a reward or penalty for the results of an enterprise's production management. Under such circumstances, the advantageous position devolves to the consumer, forcing the productive enterprise to develop competition in a struggle for the consumer market. As a result, social requirements are satisfied and the economic results for the whole society are improved. It should be pointed out that although a market in which supply exceeds demand is a condition for the formation of competition, the process of supply exceeding demand must be controlled. As for the measures that would be appropriate, this can be regulated by economic organs through the plan and through various kinds of economic levers.

Along with the expansion of competition and enterprise authority to make their own decisions, enterprises have begun to break through the boundaries of trade, territory, and system of ownership and to establish direct lateral realtionships between industrial enterprises, between industrial enterprises and commercial enterprises, between industrial enterprises and agricultural enterprises, between civilian and military industrial enterprises, and between industrial enterprises and scientific research organs, giving rise to many kinds and forms of professional cooperation and joint bodies. Of these, there are joint producers' bodies for joint cooperation in turning out a given product, joint marketing bodies for the joint marketing of products, joint product research bodies for joint cooperation in carrying out the development of new products and new technologies, and agricultural-industrial, or agricultural-commercial bodies for the processing of subsidiary agricultural products. In every kind of joint economic body, there is some process of concentration of production or concentration of capital that has not come to the people's attention, and the professional cooperation and union have given rise to a noticeable new production force. Capitalist professional cooperation and alliances developed out of competition. Free competition elicits a concentration of production and concentration of capital, and when that concentration reaches a certain stage, it produces monopoly, the emergence of alliances of medium and small enterprises, and the annexation of medium and small enterprises by large enterprises, producing trusts, cartels, concerns, and other such monopolistic special cooperation and joint organizations. Will professional cooperation and alliances follow this same route under socialist conditions? Of course not. Because we have a socialist planned economy, the organization of various kinds of joint economic bodies can constitute a unified program, a rational arrangement, and can be carried on step by step in a planned way. However, in the same way, it is impossible to avoid competition within certain limits. Because we can produce only an internal requirement for professional cooperation and alliances by developing competition between enterprises, that alliance can succeed only when the economic benefit of the enterprises is protected and expanded under professional cooperation and alliance. If it is not like this, under circumstances rather in which the enterprises have not felt this need, even to the injury of their interests, joint economic bodies can be forced upon the enterprises by administrative order, but such alliances would only be one of form. We have had this lesson.

Expansion of the authority of an enterprise to make its own decisions brings with it the corresponding problem of who is to make policy on the important questions concerning the enterprise. Our enterprises are socialist enterprises, and from the standpoint of theory it of course is the workers who shoud be the masters in their own house. However, since the enterprise has no authority to make its own decisions, although one may say that the workers are participating in management, they are actually being allowed to complete the tasks that have been handed down by their superiors; they are certainly not taking part in making policy for any of the enterprise's important questions. Expansion of the enterprise's authority to make its own decisions solves the problem of the enterprise having or lacking authority, but after it has the authority, the question of who will exercise it has still not been answered. One of the important questions here is that we must clarify and solve the relationship between enterprise management and the workers. In some socialist countries, there is still a kind of subordinate relationship between management and the workers, and the operating situation of the enterprise is always determined by the management. Yugoslavia practices worker autonomy, and management is responsible to the workers' committee. Starting from the actual situation in China, in some enterprises we conducted experiments making employee representative congresses the highest organ of authority in the enterprise and gradually developed management through election by the employees' congress, with simultaneous appointment by the state. Thus, management was responsible to the employees' congress and also responsible to the state. The employees' congress made policy regarding important questions of the enterprise, and management participated in the whole policy making process and also implemented the resolutions of the employees' congress. This kind of policy making system seems to be more suitable to the present reality of China's enterprises.

In the foregoing we have briefly related several aspects of the Sichuan experiment in the reform of China's economic system. These reforms gave the Sichuan economy a strength it has not had before. Comparing 1979 with 1978, in 84 local industrial enterprises out of the 100 experimental enterprise units, gross product value increased by 14.9 percent and profits turned over to the state increased 24.2 percent--figures higher than those in enterprises not involved in the experiment. In 1980, five enterprises experimentally taking responsibility for profit and loss displayed new vitality. Compared to 1979, their gross product value increased 41.2 percent, profits increased 81.7 percent, and collection of revenues turned over to the state increased 47.6 percent. In industries experimentally retaining a portion of the profits, the rate of economic growth was not as great as in 1979 because of adjustments to the national economy, increased prices of some raw materials, reduced prices of some products, and a general increase in employees' wages. There were, however, striking advances in improved quality, improved economic benefits, reform of the product structure, increased social wealth, and satisfied consumers. This is a complete turnaround from what was required by our former route of economic development of heavy capital construction, light production, high accumulation, and low efficiency. In addition, there was unprecedented progress in matters of the collective welfare of the enterprises, particularly with regard to housing construction, and there were relatively large increases in the income of individual workers. A point was proposed here: The results of the reform of the economic system should not be measured simply by the rate of economic growth for a given time, but should be measured by the degree to which they satisfy the needs of consumers. We should also consider that expansion of the authority of enterprises to make their own decisions transforms enterprises from "beads of the abacus" into organisms with great vitality that can propagate themselves, gives employees real content and a material base for being masters in their own homes, and provides a vast world for the full development of talent among leading cadres, managers, and technical personnel. These changes have more far-reaching significance than any increase in economic results for a single period.

Of course, the past 2 years of experiments in reform of the sytem in Sichuan have not all been smooth sailing. Because of contradictions between new systems that had already been reformed and old systems that had not yet been reformed, contradictions between adjustment and reform, etc., our reforms could not help being faced with many complications and difficulties. However, we have already basically determined the general direction of the reform, that is: to consciously employ economic laws according to the requirements for developing a commodity economy and encouraging the socialization of large production, under conditions whereby the dominant position of the system of public ownership of the means of production would be maintained; to transform the system of highly centralized state policy making to a system of combined policy making by the state, the economic units, and the individual workers; to transform the simple plan regulation to full development of the effect of market regulation under the guidance of the plan; and to transform management of the economy through administrative methods to management of the economy principally through economic organization, economic methods, and economic laws. Therefore we are fully able to resolve these contradictions by summarizing the economic lessons of our experiments in the guidance of the general direction, we are fully able to continue to proceed with the reform experiments in the midst of economic adjustment.

At present, an extraordinarily important problem posed in the course of practice is: when the reforms produced by the expansion of the authority of enterprises to make their own decisions reach a certain point, we must have a further solution of the question of how to strengthen the plan guidance of the whole national economy under the new conditions of market regulation entering into economic life, and to combine planning closely with the market.

The expansion of the authority of an enterprise to make its own decisions and the implementation of market regulation have a positive effect on motivating that enterprise to increase production of products suitable to the market, and on improving economic results, in order to achieve the socialist production targets and satisfy the material, cutlural, and livelihood needs of members of the whole society. However, when state-operated enterprises are relatively independent commodity producers, retain a portion of the profits, and especially take responsibility for profit and loss, the quality of management and the amount of profit have a direct effect on the vital interests of the enterprise and its employees. Therefore, they must not only consider the needs of the whole society in their production management, but they must also consider the interests of the enterprise itself. So, an enterprise might easily develop contradictions with the requirements for the development of the whole national economy in the direction of its production management, in decision to utilize capital is has raised for itself to expand re-production, or in the allocation of bonuses; it might cause redundant production or redundant construction to occur; or it might award bonuses indiscriminately. We are presently encountering these problems. However, the method of solving them is definitely not to hobble the production management activities of an enterprise, but to strengthen planning guidance from a larger angle while continuing to enliven that enterprise, and to combine the interests of that enterprise with the interests of the whole society. For example: an enterprise can carry out production management activities on its own, but it cannot change the production direction formulated by the state for that enterprise, and it must accept state orders for goods and complete the state plan. An enterprise can utilize capital it has raised itself in expanding re-production closely related to simple re-production, but the direction of investment must match the requirements of national development and must undergo comprehensive assessment and approval by state planning organs. Under profitable circumstances, an enterprise can award additional bonuses to its employees or promote them to higher wage levels, but these may not exceed the range of increase specified by the state for total wages. There must be a multichannel circulation for both means of production and consumer materials, and an enterprise can sell a portion of its product itself, but state-operated materials enterprises and commercial enterprises should always be the main bodies of the various kinds of circulation channels. In short, an enterprise's production management activities must satisfy these two conditions: they must suit that enterprise's own economic interests, and they must also suit the requirements of national economic development.

Solutions to the foregoing several problems are easy to talk of but extremely difficult to carry out. We must formulate correct policies, adopt appropriate economic methods, and conduct strict economic legislation and economic supervision to be able to achieve them. In the relationship between planning and the market, market regulation is like a fine horse, and planning guidance is the rider controlling this horse. What we need in a rider is this although he cannot beat the horse to death, neither can he let it go uncontrolled, allowing it to become a wild horse without reins, running wildly everywhere; he must control it while advancing along the track of socialism. This is a kind of driving skill for controlling a commodity economy under the socialist system. Learning this kind of driving skill is difficult, but it must be learned, for otherwise we will have no way to maintain the correct direction or to realize the objectives of reform of the economic system.

In the midst of the reform experiments, we solved the problem concerning what relatively independent economic interests an enterprise under the system of ownership by all the people should have and we devised and tried several forms of allocation of profit between state and enterprise; all of this constituted a great breakthrough in both theory and practice. If an enterprise has its own economic interests, it will have an internal economic motivation, and the whole economy will have vitality. However, just as can happen in the development of any matter, no sooner are old contradictions resolved than new problems arise. For its own development and growth, an enterprise must always increase the proportion of profit retained; however, state finance departments are then afraid that the enterprise will get more and reduce the income of public finance. These contradictions tell us that it is not enough just to acknowledge that enterprises under the system of ownership by all the people ought to have relatively independent economic interests. We must formulate rational restrictions on the amounts of profit allocations between state and enterprise. Speaking concretely, even after an enterprise has been changed from the system of uniform receipts and expenditures to retention of a percentage of profit or responsibility for profit and loss, there must be a clear delineation as to what portion of the simple receipts that is has created should be concentrated with the state and what portion retained by the enterprise, as well as which expenditures will be taken care of by the state and which expenditures are the responsibility of the enterprise. This should all be done so as to guarantee the the primacy of the state's interest and also guarantee a reasonable interest for the enterprise.

On the basis of these requirements, we suppose that under conditions where an enterprise is responsible for profit and loss, expenses for maintaining simple re-production, expenses for carrying out expansion of re-production closely connected to simple re-producttion, expenses for conducting matters relating to employee' collective welfare, and employees' wages and bonuses can all be considered to be paid by that enterprise. To encourage the activism of the enterprise it should retain a part of the profit obtained as a result of improved production and economic management. The actual method of allocation should be: the above-listed items should first be deducted from the net income of the enterprise, and the portion that is left will be subject to the collection of industrial and commercial tax, income tax, fixed asset tax, resource tax, and other various kinds of taxes that will be paid over to the state. Having gone through this distribution, how much of the net income created by an enterprise will be given over to the state and how much retained by the enterprise will emerge as a rough proportion. Judging by recent circumstances, the size of the ratio of profit retained by the enterprise is limited only by whether or not public finance is able to recoup from the increase in enterprise profit for that year. Only in this way will the reform of the economic system be able to develop healthily within a stable increase in state finance receipts or under conditions where, although receipts do not increase, disbursements are correspondingly reduced.

On problems related to economic interests, besides the contradiction between state and enterprise, contradictions have also appeared between one enterprise and another. In the past the profit of each enterprise, no matter hwo large or small, was all turned over to the state, so there were no differences in interest between enterprises. Since the reform, however, the income of an enterprise has been shifted to how much profit that enterprise makes, and the differnces between enterprises have vecome evident. This illustrates a condition that we often refer to as "hardship and happiness are not divided equal." There are subjective reasons and objective reasons for hardship and happiness being unequally divided and what we will discuss here are the unequal objective conditions of enterprises that result in that inequality of hardship and happiness--such as prices not being set rationally enough, great differences in the level of technical equipment, different degrees of abundance or lack of natural resources, etc. Because, on the one hand, objective conditions are unequal, but, on the other hand the same yardstick is used to measure enterprises economic results, using a single ratio to recover profit for retention gives those enterprises with the best objective conditions an excess profit that they did nothing to create; in the case of other enterprises, disadvantageous external conditions may cause them to go uncompensated for their efforts. These irrational circumstances have a serious influence on the activism of some enterprises and weaken the effects of the reform. We are now striving to change such kinds of circumstances. Practice tells us that the creation of external conditions that are for the most part objectively equal for the enterprises is a basic requirement for the implementation of reform of the economic system. Moreover, this requirement can be realized only in the midst of reform, and the most important part of this is reform of the price structure and the tax system. Reform of prices is extraordinarily difficult, however, and with our country presently in a period of economic adjustment we should be even more prudent. Under these circumstances, we must find some interim method to solve the probelm of the unequal division of hardship and happiness in the economic interests of enterprises.

The economic management system is an integral whole, and the production, circulation, distribution, and consumption systems, etc., are each one aspect of this whole. Moreover, they are linked to one another. They combine in a network that is difficult to loosen or to separate. When you pull one link, it moves everything. Because of this, the reform of the economic system must be linked to form a whole. It will not do to simply conduct a reform of one aspect. The 2-year reform experiment in Sichuan was like this: starting with the expansion of an enterprise's authority to make its own decisions, the reform of several aspects, production, circulation, and distribution, was conducted in mutual combination. Of these aspects, distribution is the core of reform, for without reform of distribution, other reforms are meaningless. Moreover, without reform of production, circulation, etc., reform of distribution cannot be effected. There is one view that says that the reform of a country's economic system must be "complete" and "simultaneous"; otherwise there is little chance for success. Reform of enterprise management can be conducted only after the external conditions of the enterprise have been provided for; otherwise it will create confusion. For this reason, reforms must begin with the formulation of a complete, overall program, and after formation of the program, it should be implemented simultaneously, in every area, throughout the country. There is a certain sense to this viewpoint. Without experimental reform of a part, however, the complete overall reform program will not be successful. In a country like ours of almost 1 billion people, there is no way to implement reform simultaneously throughout the country, even if we begin very early in the morning. Therefore, under conditions in which the overall program has not yet been designed, the reform can first consider small systems, later medium-size systems, and finally big systems. In the plan carried out in Sichuan, beginning with the expansion of the authority of enterprises to make their own decisions, the reform of materials, commercial, and finance organizations was in reality a small system. The later implementation of enterprise responsibility for profit and loss, with the need to carry out simultaneous reform of the price structure, the tax structure, and other aspects, could be a medium-size system. Finally, enterprises still had to be liberated from departmental and district subordination and conduct economic management independently, requiring simultaneous reform of the whole economic guidance arrangement; this could be a kind of large system. In short, it will not do to carry out reform except by systems, but neither will it do to make further changes once a system is complete. The complete reform program includes the theory of reform and the direction dictated by principles, the specific requirement for reforming each kind of organization, as well as the procedures, forms, and methods for implementing the reforms. These are all necessary to for successful reform, but this kind of program must start with the realities of our country and be truly a Chinese type. The procedure, form, and methods of implementation must be positive and safe, and be a gradual transition, to ensure that every reform measure will have a positive effect on the development of production.

The Sichuan experiment in reform was carried out in the midst of our county's readjustment of the national economy. Economic readjustment has destroyed some of the shortage situations that have existed for a long time, whereby the supply of commodities fails to meet demand, and has made it possible to employ the market mechanism to develop competition in economic reform. However, because of the economic readjustment, the production tasks of some enterprises were inadequate, and there was no way to implement the reform. At present, it is absolutely necessary that readjustment be the central task of our national economy and that reform serve readjustment; otherwise there will be no way to overcome the serious difficulties facing our economy.

Taking the long-range view of the problem, however, the fundamental solution for our economic development still lies in reform. The present readjustment is for the sake of establishing the conditions for complete reform in the future. One view is that we carried out readjustment because reform is wrong, but this is completely erroneous. There is nothing wrong with reform. If it had not been for the reforms of the past 2 years, we would not have the present good situation. On the contrary, because of the influence of long-time "leftist" errors in economic work and mistakes in economic policymaking, there has been a serious proportional dislocation influencing the reform. There is also the view that with readjustment as the central task, we should not carry out reform; this too is incorrect. Some reforms might influence the readjustment, but will on the contrary advance it, and some readjustmants could not have any beneficial result without undergoing reform. Therefore, in the readjustment, all reforms beneficial to the readjustment must be carried out actively, so as to encourage readjustment through reform.

At present, the reforms we are emphasizing are: While continuing to revitalize the microeconomy, strengthen plan guidance for the macroeconomy. This is completely consistent with the centralization and unification required by the readjustment. Utilize advantageous opportunities in the readjustment to accelerate the pace of professional cooperation and association. It is perfectly possible to combine this with the closing down and simultaneous shifting of some enterprises. Actively advance the internal reform of the enterprise, the reform of the product structure, and the reform of the guidance system, for this is what is required by the transformation of our production and construction policy, Carry out experiments in responsibility for profit and loss within a certain sphere, and obtain even better experience, as is required to prepare for the adoption of future new reform procedures.

Reform of the economic system is where our hopes for carrying out the four modernizations lie. The experiment in reform of the Sichuan economic system will move forward unswervingly.

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27 Aug. 1981